





EDWARD M. KINDLE
VICTORIA MEMORIAL MUSEUM
OTTAWA, CANADA

State of New York.

FIFTEENTH ANNUAL REPORT

(1861)

OF THE

Regents of the University of the State of New-York,

ON THE CONDITION OF THE

STATE CABINET OF NATURAL HISTORY,

AND THE

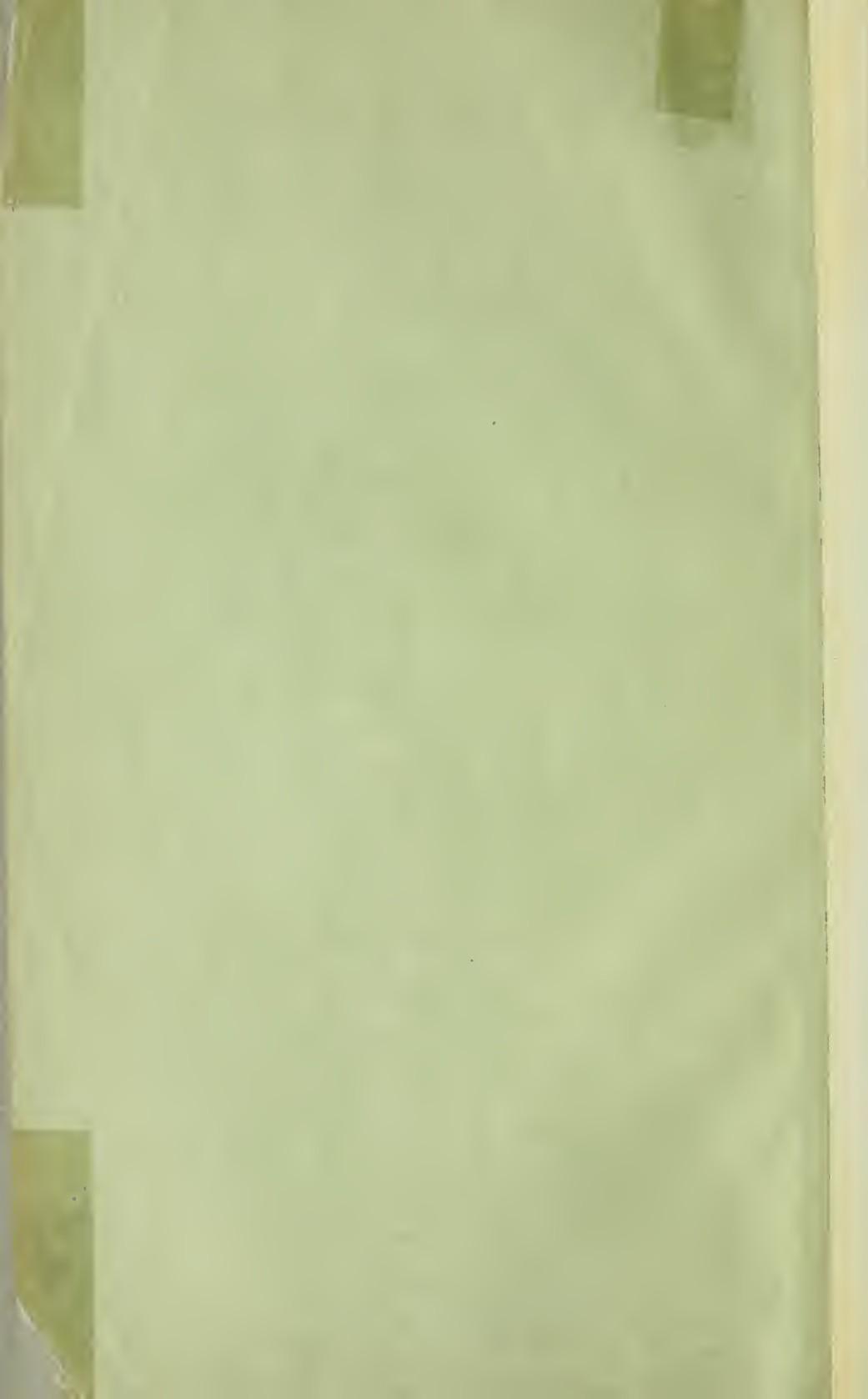
Historical and Antiquarian Collection Annexed Thereto.

TRANSMITTED TO THE LEGISLATURE APRIL 12, 1862.

A L B A N Y :

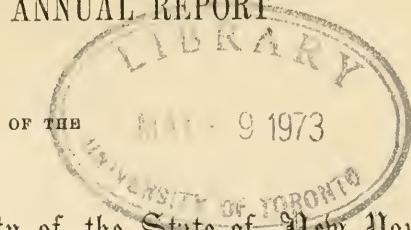
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1862.



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FIFTEENTH ANNUAL REPORT



Regents of the University of the State of New-York,

ON THE CONDITION OF THE

STATE CABINET OF NATURAL HISTORY,

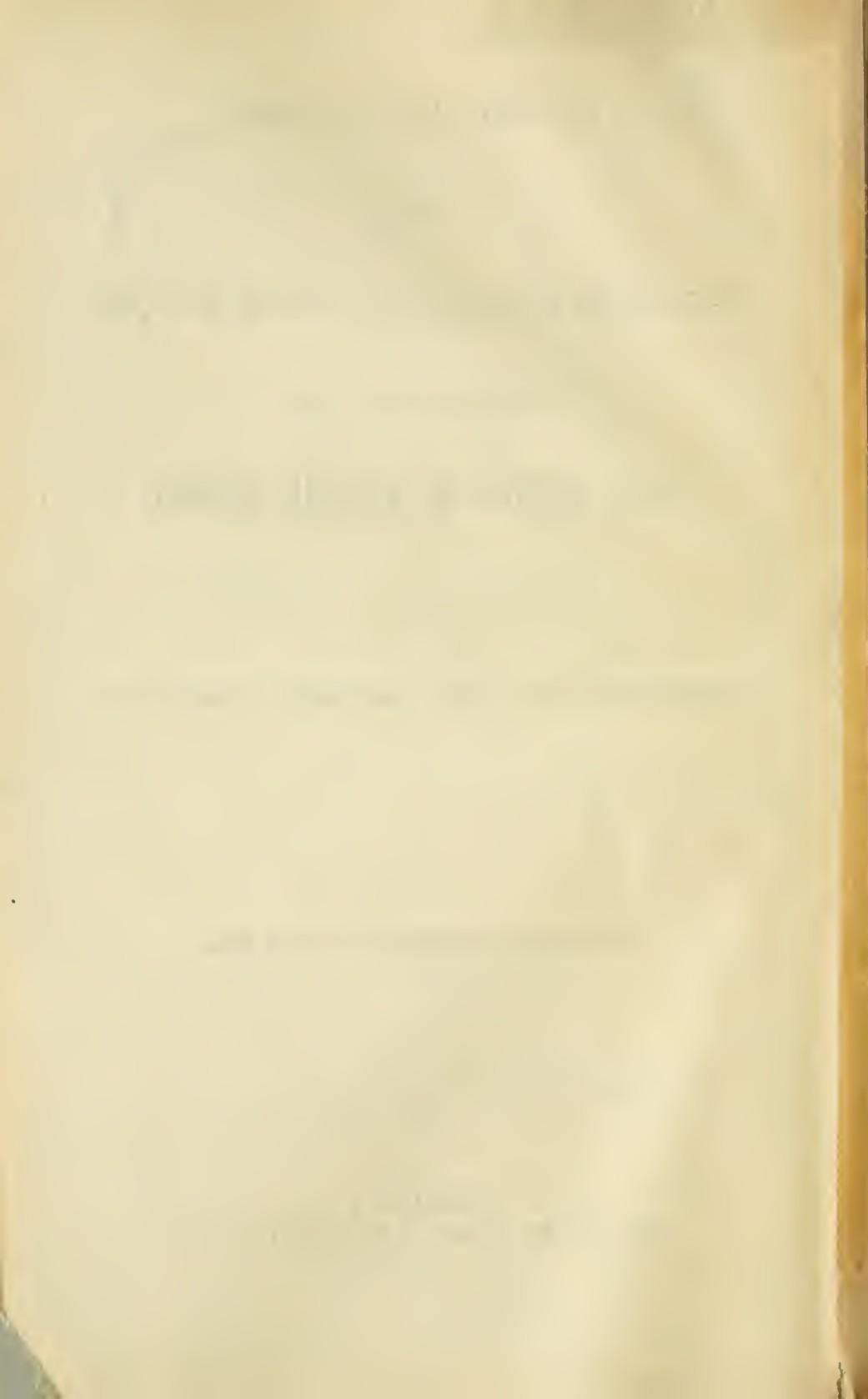
AND THE

HISTORICAL AND ANTIQUARIAN COLLECTION ANNEXED THERETO.

Made to the Legislature, April 12, 1862.

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ALBANY:
PRINTED BY CHARLES VAN BENTHUYSEN.
1862.



State of New York.

No. 116.

IN SENATE,

April 12, 1862.

FIFTEENTH ANNUAL REPORT
OF THE REGENTS OF THE UNIVERSITY OF THE STATE OF
NEW-YORK, ON THE CONDITION OF THE STATE CABI-
NET OF NATURAL HISTORY, AND THE HISTORICAL AND
ANTIQUARIAN COLLECTION ANNEXED THERETO.

UNIVERSITY OF THE STATE OF NEW-YORK :

OFFICE OF THE REGENTS, }
ALBANY, April 12, 1862. }

TO HON. ROBERT CAMPBELL,

Lieutenant-Governor and President of the Senate.

SIR :

I HAVE the honor to transmit the Fifteenth Annual Report of the Regents of the University, on the State Cabinet of Natural History, and the historical and antiquarian collection annexed thereto.

I remain, very respectfully,

Your obedient servant,

JOHN V. L. PRUYN,

Chancellor of the University.

REGENTS OF THE UNIVERSITY.

JOHN V. L. PRUYN, LL.D., *Chancellor.*

GULIAN C. VERPLANCK, LL.D., *Vice-Chancellor.*

EX OFFICIO.

EDWIN D. MORGAN, *Governor.*

ROBERT CAMPBELL, *Lieutenant-Governor.*

HORATIO BALLARD, *Secretary of State.*

VICTOR M. RICE, *Superintendent of Public Instruction.*

ERASTUS CORNING.

Rev. JOHN N. CAMPBELL, D.D.

PROSPER M. WETMORE.

ERASTUS C. BENEDICT.

JOHN LORIMER GRAHAM.

GEORGE W. CLINTON.

GIDEON HAWLEY, LL.D.

Rev. ISAAC PARKS, D.D.

JAMES S. WADSWORTH.

LORENZO BURROWS.

ROBERT CAMPBELL.

ROBERT S. HALE.

Rev. SAMUEL LUCKEY, D.D.

ELIAS W. LEAVENWORTH.

ROBERT G. RANKIN.

J. CARSON BREVOORT.

GEORGE R. PERKINS, LL.D.

S. B. WOOLWORTH, LL.D., *Secretary.*

STANDING COMMITTEE OF THE REGENTS,

SPECIALLY CHARGED WITH THE CARE OF THE STATE CABINET.

1862.

EDWIN D. MORGAN (*Governor*).

HORATIO BALLARD (*Secretary of State*).

Rev. Dr. CAMPBELL,

Mr. GRAHAM,

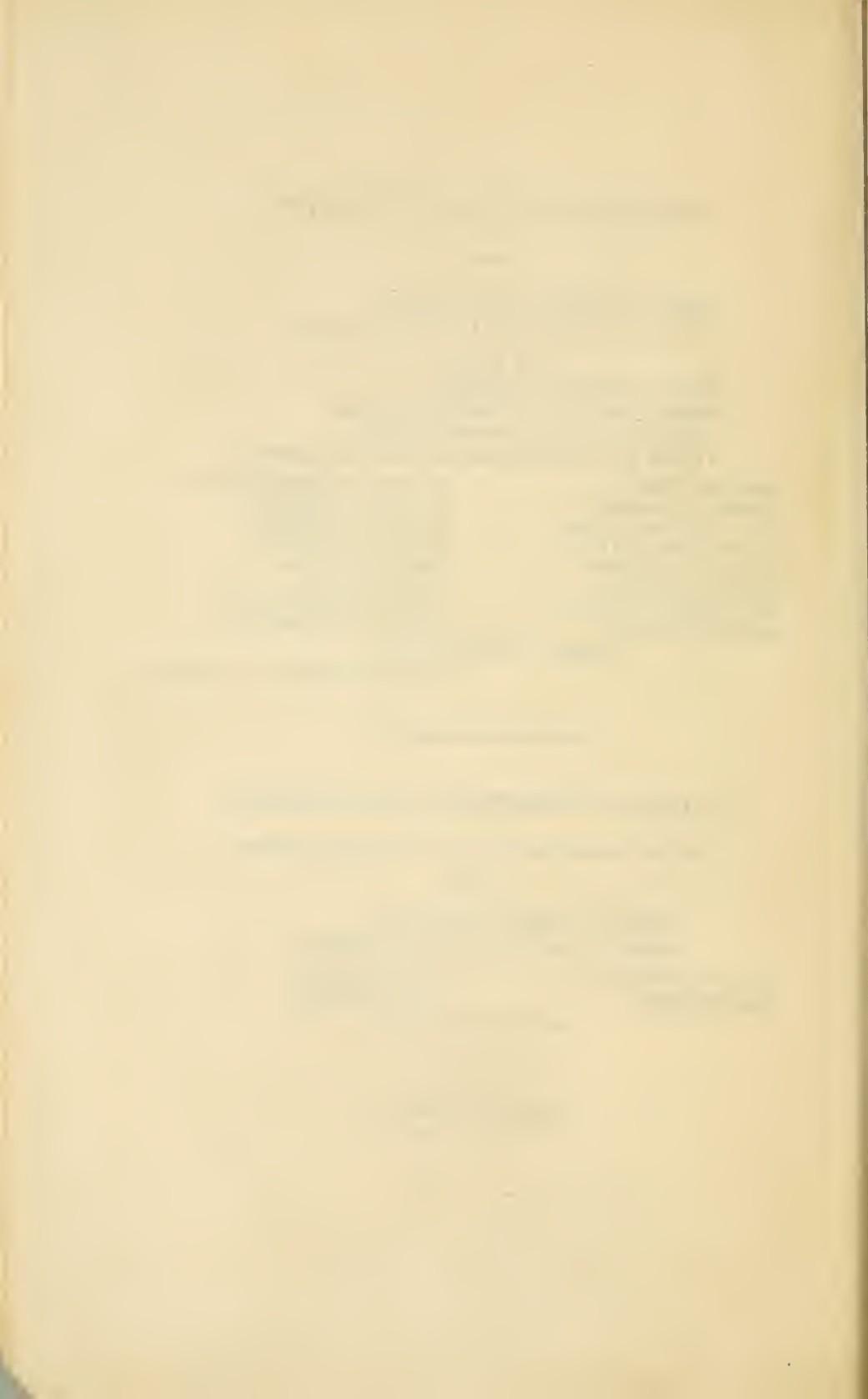
Mr. CORNING,

Mr. BURROWS,

Mr. LEAVENWORTH.

CURATOR.

EZEKIEL JEWETT.



REPORT.

To the Legislature of the State of New-York.

THE Regents of the University respectfully report :

That the collections of the Cabinet have been carefully preserved during the past year : those in Natural History, which are peculiarly liable to ravage and even destruction by insects, are entirely uninjured; a condition to be ascribed principally to the excellent construction of the cases in which they are enclosed.

The Shells from the Smithsonian Institution, referred to in the last Report, have been named, and a full Catalogue is hereto appended.

A generous donation of Freshwater Shells has been received from JOHN G. ANTHONY, Esq., of Cincinnati, Ohio. These are also catalogued.

The collections in the Palæontology of New-York, occupying the entire second floor of the Hall, are in process of labelling and re-arrangement. This will soon be completed, and will be made as nearly as possible to conform to the natural position of the rocks from which the fossils are taken.

Some additions have been made to the collections in Economic Geology. The enlargement of this department will receive renewed attention during the present year, and the Regents hope to be able hereafter to present a fair exhibition of the natural resources of the State applicable to the various purposes of life.

Some of the results of Prof. HALL's investigations in Palæontology are herewith communicated. These contributions, anticipating the publication of the volumes on this subject in the Natural History of the State, are earnestly sought by those pursuing similar investigations.

The Regents have availed themselves of every opportunity to perpetuate memorials of the Indian nations who inhabited the State of New-York. These nations have gradually faded away, and will soon be known only in the records of history. An unpublished manuscript, being a grammatical and lexicographical treatise on the language of the Mohawks, has been entrusted to the Regents, and is herewith communicated, with a recommendation that it be printed in the appendix to this report.

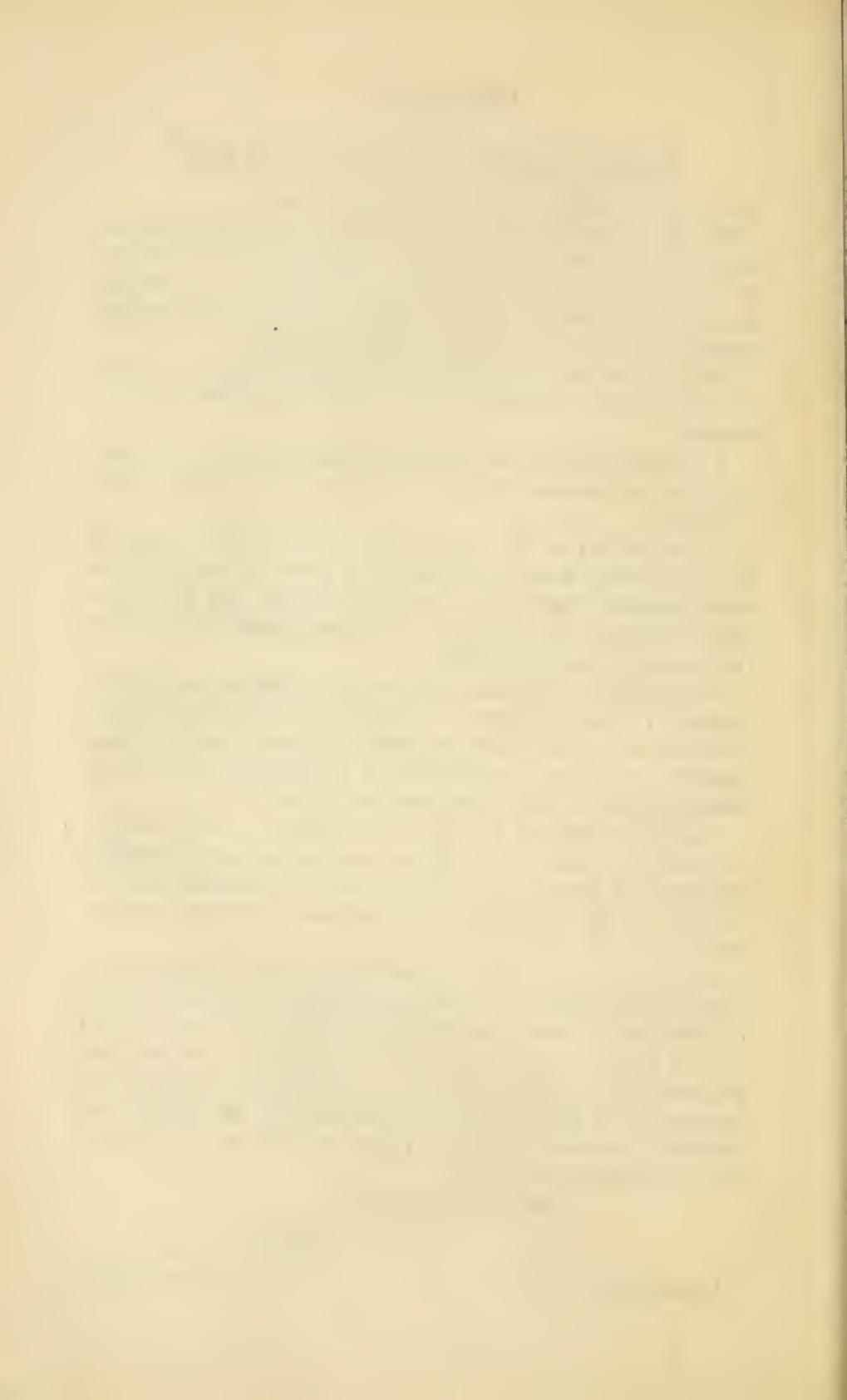
Respectfully submitted,

By order of the Regents.

JOHN V. L. PRUYN,

Chancellor of the University.

ALBANY, April 11, 1862.



ACCOUNT CURRENT.

THE Secretary of the Regents of the University, in account current with the appropriation for preserving and increasing the State Cabinet of Natural History,

DR.

1860-61. To balance to new account (See Assembly Document No. 136, 1861, p. 9),	\$388 02
To amount received from the Comptroller, being the annual appropriation for 1860-61	800 00
To balance from account of appropriation for altering and repairing the Geological Hall	2 52
	<u><u>\$1190 54</u></u>

CR.

1860-61. By cash paid an assistant	\$70 00
.. specimens of natural history	32 00
.. books	22 00
.. freight charges	27 33
.. postage and stationery	25 93
.. chemicals	33 75
.. repairs, etc.	43 57
.. new cases	225 00
	<u><u>\$479 58</u></u>
By balance	710 96
	<u><u>\$1190 54</u></u>

ALBANY CITY BANK : *October 4, 1861.* I certify that there is a balance of seven hundred and ten and $\frac{9}{10}$ dollars, standing to the credit of the State Cabinet of Natural History, on the books of this bank.

(Signed) H. H. MARTIN, *Cashier.*

In behalf of the Standing Committee on the State Cabinet, I have examined the above account, and find it correct. The payments have been made by order of the Standing Committee, and are accompanied with proper vouchers.

E. D. MORGAN, *Chairman.*

CONTENTS OF THE APPENDIX.

- A. Donations to the State Cabinet, from January 1, 1861, to January 1, 1862.
- B. Catalogue of Shells presented by JOHN G. ANTHONY of Cincinnati, Ohio.
- C. Catalogue of Shells from the duplicates collected by the U.S. Exploring Expedition, presented by the Smithsonian Institution.
- D. Contributions to the Palaeontology of New-York, by Prof. JAMES HALL.
- E. Radical Words of the Mohawk Language, with their derivatives : By Rev. JAMES BRUYAS S. J., Missionary on the Mohawk. Published from the original manuscript.

APPENDIX.



(A.)

DONATIONS TO THE STATE CABINET OF NATURAL HISTORY,

From January 1, 1861, to January 1, 1862.

From Dr. ARMSBY.

One Mummy of an *Ibis*, from the Catacombs of Egypt.
Large GRASSHOPPER, from Africa.

H. B. NORTROP, Esquire, Sandyhill.

One INDIAN RELIQUE : Stone in the form of an egg.

JAMES POWERS, Bath.

One BANDED GARFISH.

WILSON MILLER.

One ECHINUS, West Indies.

SAMUEL L. SMITH, Ireland Corners.

TWO RING-SNAKES.

JOHN SMITH, New-York.

Two Bottles of SALT, Saginaw, Michigan.

Hon. GEORGE W. CLINTON, Buffalo.

Six Specimens of BANDED PROTEUS.

J. P. BARNUM, Genoa, Cayuga County.

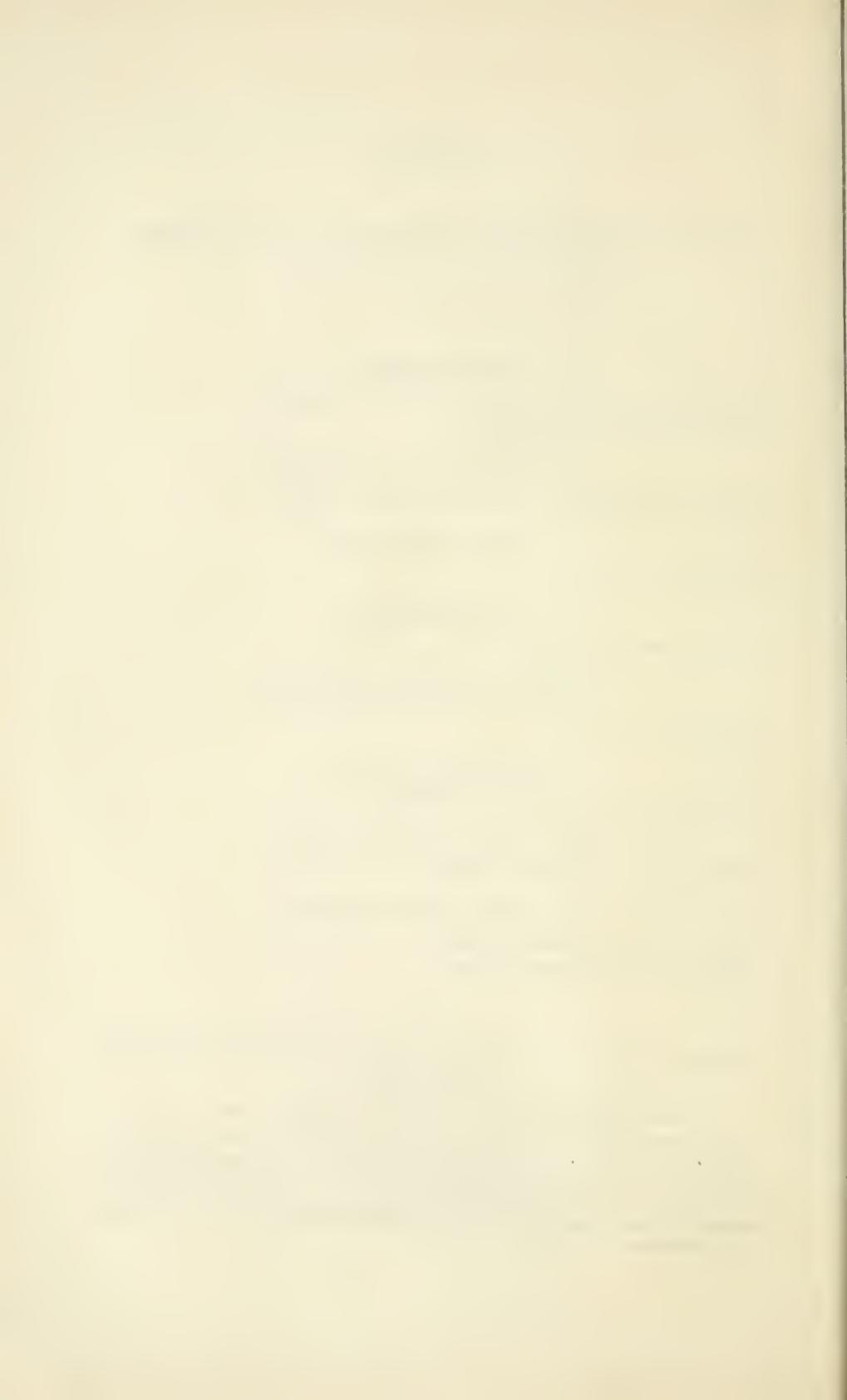
FOSSILS from the Hamilton group.

INDIAN STONE HAMMER, Genoa.

NOTICE of a Mole not enumerated by DEKAY in the Fauna of the State:
BY S. F. BAIRD.

SCALOPS BREWERI, Bach. Hairy-tailed Mole.

This species of Mole, although not mentioned by DEKAY in the State Natural History, is in reality very abundantly to be met with in the northern part of the State, and apparently to the exclusion of the more southern species with white naked tail, *S. aquaticus*. Its burrows are very different from those of the latter species; being at a considerable distance beneath the surface, with heaps of loose earth thrown up at intervals over the gallery, without any kind of entrance whatever.



(B.)

CATALOGUE OF SHELLS,

FROM JOHN G. ANTHONY, CINCINNATI, OHIO.

FRESHWATER SHELLS.

UNIO ALASMODONTINUS	Barnes	Ohio.
ALATUS	Say	Ohio.
AMANUS	Lea	
ARGENTEUS	Lea	Tennessee.
BIGBYENSIS	Lea	Tennessee.
BREVIDENS	Lea	Tennessee.
BREVIS	Authors.	
BUCKLEYI	Lea	Florida.
CÆLATUS	Conrad	Tennessee.
CAPAX	Green	Indiana.
CAPOCEFORMIS (male & female),	Lea	Tennessee.
CARDIUM	Rafinesque	Ohio.
CARIOSUS	Say	Pennsylvania.
CHATTANOOGAENSIS	Lea	Alabama.
CICATRICOSUS	Say	Ohio.
COLLINUS	Conrad	Virginia.
COLUMBENSIS	Lea	Georgia.
CONESTATOR	Lea	Georgia.
CONRADICUS	Lea	Virginia.
CONSTRUCTUS	Conrad	Virginia.
CORNUTUS	Barnes	Ohio.
CORROSUS	Villa	Italy.
COSTATUS	Rafinesque	Ohio.
CRASSUS	Say	Ohio.
CUMBERLANDIANUS	Lea	Tennessee.
CUNEATUS	Rafinesque	Ohio.
CUNEOLUS	Lea	Tennessee.
CYLINDRICUS	Say	Ohio.
CYPHIUS	Rafinesque	Esopus Green, O.
DECISUS	Lea	Alabama.
DOLABELLOIDES	Lea	Tennessee.
DOLABRIFORMIS	Lea	Georgia.

UNIO DOWNIEI	Lea	Georgia.
DROMAS	"	Tennessee.
EDGARIANUS	"	Tennessee.
ELLIPSIS	"	Ohio.
EXCAVATUS	"	Alabama.
EXIGUIS	"	Georgia.
FALLAX	"	Georgia.
FASCIOLARIS	Rafinesque	Ohio.
FASCIOLUS	Rafinesque	Ohio.
FATUUS	Lea	Tennessee.
FISHERIANUS	Lea	Maryland.
FLAVUS	Rafinesque	Ohio.
FLEXUOSUS	Rafinesque	Ohio.
FOLLICULATUS	Lea	Virginia.
FOREMANIANUS	Lea	Alabama.
FORSHEYII	Lea	Alabama.
FRAGILIS	Rafinesque	Ohio.
FRAGOSUS	Conrad	Ohio.
FRATERNUS	Lea	Ohio.
GIBBER	Lea	Tennessee.
GIBBOSUS	Barnes	Ohio.
GIBBOSUS (male and female)	Rafinesque	Ohio.
GLANS	Lea	Indiana.
GLOBULUS	Say	Louisiana.
HALLENBECKII	Lea	Georgia.
HANLEYANUS	Lea	Alabama.
HAYSIANUS	Lea	Tennessee.
HEROS	Say	Ohio.
HETERODON	Lea	New-York.
HETERODON	Lea	Massachusetts.
HOPETINENSIS	Lea	Georgia.
HYDIANUS	Lea	Louisiana.
INCRASSATUS	Lea	Georgia.
INFUCATUS	Conrad	Georgia.
INTERCEDENS	Lea	Georgia.
INTERMEDIUS	Conrad	Tennessee.
INTERRUPTUS	Rafinesque	Tennessee.
IRRORATUS	Lea	Ohio.
JEJUNUS	Lea	Virginia.
KLEINIANUS	Lea	Georgia.
LAPILLUS	Say	Ohio.
LANCEOLATUS	Lea	Virginia.
LEPTODON	Rafinesque	Ohio.
LINDSLEYI	Lea	Tennessee.
LUGUBRIS	Lea	Georgia.
MARGINATUS	Lamarck	East Indies.

UNIO METANEVER	Rafinesque	Ohio.
MONODONTUS	Say	Tennessee.
NASHVILLIANUS	Lea	Ohio.
NASUTUS (male and female)	Say	Ohio.
NERVOSUS	Rafinesque	Ohio.
NEXUS	Say	Tennessee.
NIGER	Rafinesque	Ohio.
NITENS	Lea	Tennessee.
NOVÆBORACI	Lea	Michigan.
OBESUS	Lea	Georgia.
OBOVATUS	Rafinesque	Ohio.
OBTUSUS	Lea	Georgia.
OHIOENSIS	Rafinesque	Ohio.
ORBICULATUS (male & female)	Hildreth	
OVATUS	Say	Ohio.
PARVUS	Barnes	Ohio.
PAULUS	Lea	Georgia.
PELLUCIDUS	Lea	Ohio.
PERCOARCTATUS	Lea	North-Carolina.
PERDIX	Lea	Tennessee.
PERNODOSUS	Lea	Alabama.
PERPLICATUS	Conrad	Alabama.
PILEUS	Lea	Ohio.
PLEXUS	Conrad	Mexico.
PLICATUS	Say	Ohio.
POLITUS	Say	Ohio.
PRASINUS	Conrad	Michigan.
PROXIMUS	Lea	Tennessee.
PULLATUS	Lea	Georgia.
PURPUREUS	Say	Maryland.
PUSTULATUS	Lea	Ohio.
PUSTULOSUS	Lea	Ohio.
PYRAMIDATUS	Lea	Ohio.
QUADRULUS	Rafinesque	Ohio.
RADIATUS	Gmelin	New-York.
RANGIANUS (male and female)	Lea	Ohio.
RECTA	Anthony	
RECTUS	Lamarek	Ohio.
RUBER	Rafinesque	Ohio.
SAYII	Tappan	Ohio.
SECURIFORMIS	Conrad	Georgia.
SECURIS	Lea	Ohio.
SHEPARDIANUS	Lea	Georgia.
SILIQUOIDEUS	Barnes	Ohio.
SINUS	Lea	Tennessee.

UNIO SOWERBYANUS	Lea	Tennessee.
SPARSUS	Lea	Tennessee.
SPATULATUS	Lea	Michigan.
SPISSUS	Lea	
SPLENDIDUS	Lea	Georgia.
STEWARDSONII	Lea	Tennessee.
STRAMINEUS	Conrad	Alabama.
STRIATUS	Rafinesque	Ohio.
SUBANGULATUS	Lea	Georgia.
SUBGIBBOSUS	Lea	Alabama.
SUBPLANUS	Conrad	Virginia.
SUBROSTRATUS	Say	Ohio.
SUBTENTUS	Say	Tennessee.
SULCATUS	Lea	Ohio.
TÆNIATUS	Conrad	Tennessee.
TARSUS	Rafinesque	Ohio.
TERES	Rafinesque	Ohio.
TRAPEZOIDES	Lea	Louisiana.
TORTUOSUS	Lea	Georgia.
TRIANGULARIS	Barnes	Ohio.
TRIGONUS	Lea	Ohio.
TROOSTIENSIS	Lea	Tennessee.
TRUNCATUS	Rafinesque	Ohio.
TUBERCULATUS	Rafinesque	Ohio.
TURGIDULUS	Lea	Tennessee.
TURGIDUS	Lea	Mississippi.
UNDATUS	Barnes	Ohio.
VANUXEMENIANUS	Lea	Tennessee.
VERECUNDUS	Gould	East Indies.
VERRUCOSA	Reeve	
VERRUCOSUS	Rafinesque	Ohio.
VIRIDIS	Rafinesque	North-Carolina.
ALASMODON AMBIGUA	Say	Ohio.
BONELLII	Ferussac	Europe.
CALCEOLA	Lea	Ohio.
COMPLANATA	Barnes	Ohio.
COSTATA	Rafinesque	Ohio.
DELTOIDEA	Lea	Ohio.
EDENTULA	Say	Ohio.
ELLIOTTI	Lea	Georgia.
ETOWAHENSIS	Conrad	Georgia.
FABULA	Lea	Virginia.
IMPRESSA	Anthony	
MARGINATA	Say	North-Carolina.
TRIANGULATA	Lea	Georgia.
TRUNCATA	Say	Ohio.
UNDULATA	Say	Maryland.

<i>ANODON GIBBOSA</i>	Say	Georgia.
<i>GRANDIS</i>	Say	Ohio.
<i>IMBECILLIS</i>	Say	Ohio.
<i>LATA</i>	Rafinesque	Ohio.
<i>MODESTA</i>	Lea	Michigan.
<i>MORTONIANA</i>	Lea	South America.
<i>PALLIDA</i>	Authors	Michigan.
<i>SHAFERIANA</i>	Lea	Michigan.
<i>AMPULLARIA DEPRESSA</i>	Say	Georgia.
<i>ANCULOSA CANALIFERA</i>	Authors	North-Carolina.
<i>CORPULENTA</i>	Authors	North-Carolina.
<i>ELEGANS</i>	Authors	Alabama.
<i>GENICULA</i>	Haldeman	Tennessee.
<i>GIBBOSA</i>	Lea	Tennessee.
<i>GRIFFITHIANA</i>	Lea	
<i>KIRTLANDINA</i>	Authors	Virginia.
<i>ORNATA</i>	Authors.	
<i>PATULA</i>	Authors	Tennessee.
<i>RUBIGINOSA</i>	Lea	
<i>SUBGLOBOSA</i>	Say	Tennessee.
<i>TÆNIATA</i>	Conrad	
<i>GLANDINA TRUNCATA</i>	Say	Florida.
<i>LIMNEA APPRESSA</i>	Say	Michigan.
<i>PIRENA FLUMINEA</i>	Gmelin	
<i>TEREBRALIS</i>	Lamarek	
<i>LITHASIA SHAWALTERI</i>	Lea	
<i>SOLIDA</i>	Lea	
<i>IO BREVIS</i>	Authors	Tennessee.
<i>FUSIFORMIS</i>	Lea	Tennessee.
<i>INERMIS</i>	Authors	Tennessee.
<i>SPINOSA</i>	Lea	Tennessee.
<i>PALUDINA MAGNIFICA</i>	Conrad	Alabama.
<i>PONDEROSA</i>	Say	
<i>SUBPURPUREA</i>	Say	
<i>MELANIA ACULEUS</i>	Lea	
<i>ADUSTA</i>	Authors	Tennessee.
<i>ALBESCENS</i>	Lea	
<i>ANGUSTISPIRA</i>	Authors	Tennessee.
<i>ANNULIFERA</i>	Conrad	Alabama.
<i>ARACHNOIDEA</i>	Authors	Tennessee.
<i>ASPERA</i>	Lamarek	
<i>ATHLETA</i>	Authors.	
<i>ATRA</i>	Richard	

MELANIA BICOSTATA	Authors	Tennessee.
BICINCTA	Authors	Tennessee.
CANALICULATA	Say	Tennessee.
CANALIS	Lea	
CASTANEA	Lea	Tennessee.
CATENOIDES	Lea	Georgia.
CHOCOLATUM	Brot	
COLLISTRICTA	Reeve	
CONSANGUINEA	Authors	Indiana.
COSBELLARIS	Lea	
CREBRISTRIATA	Lea	
CYLINDRACEA	Conrad	Alabama.
DACTYLUS	Lea	
DECORATA	Authors.	
EBURNUM	Lea	Tennessee.
EDGARIANA	Lea	Tennessee.
EPISCOPALIS	Lea	
FLORENTINA	Lea	Tennessee.
FOREMANIANA	Lea	
FULGIDA	Reeve	
FUNEBRALIS	Authors	Tennessee.
GLABRA	Lea	Tennessee.
GLANS	V. D. B.	
GRATA	Authors.	
HALLEBECKII	Lea	Georgia.
HASTULA	Lea	
HYBRIDA	Authors	Tennessee.
HYDEI	Conrad	Alabama.
IMBRICATA	Authors	Georgia.
INFRAFASCI	Authors	Tennessee.
INTERTEXTA	Authors	Tennessee.
IOSTOMA	Authors	Tennessee.
JAYANA	Lea	Tennessee.
LANCEA	Lea	
LATERITIA	Lea	
LEIRRINEA		
NEGLECTA	Authors	Ohio.
NIAGARENSIS	Lea	Niagara Falls.
NICKLINIANA	Lea	Virginia.
NUPERA	Say	Indiana.
OLIVULA	Conrad	Alabama.
PAGODIFORMIS	Authors	Tennessee.
PALLESCENS	Lea	
PAUCICOSTA	Authors	Tennessee.
PERNODOSA	Lea	Tennessee.
PINGUIS	Lea	Tennessee.

<i>MELANIA PLANOSPIRA</i>	Authors	Kentucky.
<i>PROSCISSA</i>	Authors	North-Carolina.
<i>PULCHERRIMA</i>	Authors	North-Carolina.
<i>PYRENELLA</i>	Conrad	Alabama.
<i>RHOMBICA</i>	Authors	Tennessee.
<i>RIGIDA</i>	Authors	Tennessee.
<i>SETOSA</i>	Swainson	
<i>SIMPLEX</i>	Say	Virginia.
<i>SPUREA</i>	Lea	Tennessee.
<i>SYMMETRICA</i>	Haldeman	Virginia.
<i>TENEBCROCINCTA</i>	Authors	Tennessee.
<i>TENEBCROSA</i>	Lea	Tennessee.
<i>TORULOSA</i>	Authors	Tennessee.
<i>UNCIALIS</i>	Haldeman	Tennessee.
<i>VALIDA</i>	Authors	Tennessee.
<i>VANUXEMENIANA</i>	Lea	
<i>VESTITA</i>	Conrad	Alabama.
<i>VIRIDULA</i>	Authors	Tennessee.
<i>VITTATA</i>	Authors	Georgia.
<i>WARDERIANA</i>	Lea	Virginia.



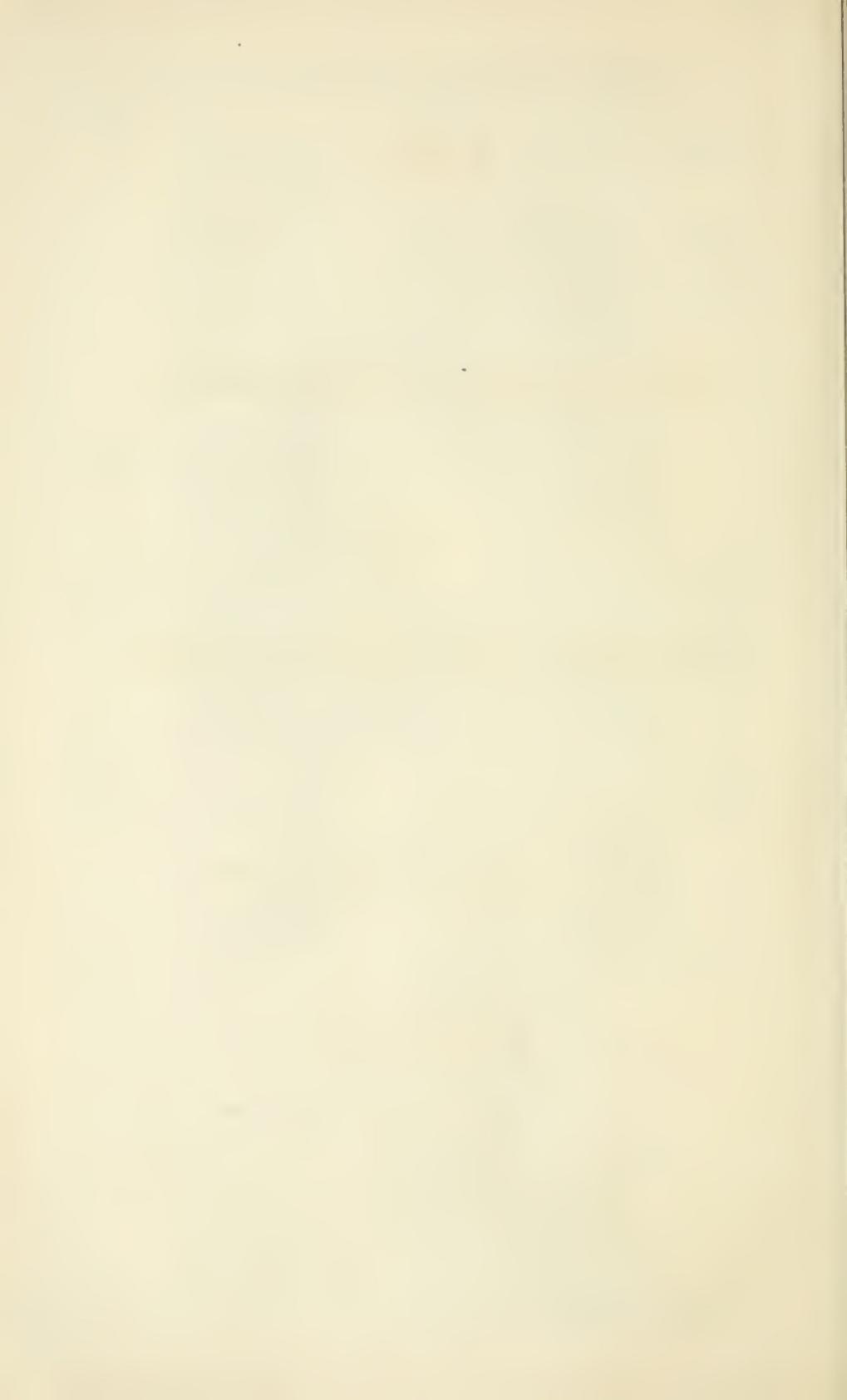
(C.)

CATALOGUE OF SHELLS,
 CONTRIBUTED FROM THE DUPLICATES COLLECTED BY
 THE EXPLORING EXPEDITION,
 BY PROF. HENRY, OF THE SMITHSONIAN INSTITUTION.

ANCILLARIA GLANDINA	CONUS ARENATUS
ARCA GRANOSA	CONUS AULICUS
ARCA HOLOSERICA	" BETULINUS
ARGONAUTA ARGO	" DAUCUS
ARGONAUTA TUBERCULOSA	" EBURNEUS
ASPERGILLUM JAVANUM	" EMACIATUS
AURICULA MIDÆ	" EPISCOPUS
BATHISA TENEBROSA	" FIGULINUS
BULIMUS DAPHNIS	" FLAVIDUS
BULIMUS FAUNUS	" GENERALIS
" FULGURATUS	" GEOGRAPHICUS
" MALEATUS	" HEBRAEUS
" OVATUS	" IMPERIALIS
" SMARAGDUS	" MARMOREUS
" VIRIDOSTRIATUS	" MILES
" WOODIANUS	" MILLEPUNCTATUS
BULIMUS, 4 sp. ind.	" MUSTELINUS
BULLA AMPULLA	" PULICARIUS
CARDIUM ALTERNATUM	" QUERCINUS
CARDIUM CARDISSA	" STRIATUS
" ELONGATUM	" TEREBRA
" UNEDO	" TESSELATUS
CASSIS CORNUTUM	" TEXTILIS
CASSIS ERINACEUS	" TULIPA
" MADAGASCARIENSIS	" VEXILLUM
" RUFÀ	" VIRGO
" VIBER	CORBIS FIMBRIATA
CERITHIUM ADANSONI	CYPREA ACHATINA
CERITHIUM ALUCO	CYPREA ANNULUS
" LINEATUS	" ARABICA
" NODULOSUM	" ARENOSA
" OBELISCUM	" ARGUS
" OBTUSA	" AURANTIA
" TELESCOPIUM	" CANRICA
" VERTAGUS	" CAPUT-SERPENTIS
CHAMA, ind.	" CARNEOLA
CONCHOLEPAS PERUVIANA	" EBURNEA

CYPREA EROSA	MYTILUS CALIFORNIENSIS
" HISTRIO	MYTILUS CHRONOS
" ISABELLA	" EDULIS
" LYNX	" SMARAGDUS
" MADAGASCARIENSIS	NASSA ARcularia
" MAPPA	NATICA MAMMILLARIS
" MAURITIANA	NATICA MAROCCANA
" MONETA	NATICA MELANOSTOMA
" OBVELATA	NATICA, sp. ind.
" SCURRA	NAUTILUS POMPILIUS
" TALPA	NAUTILUS UMBILICATUS
" TESSELATA	NERITA ALBICELLA
" TESTUDINARIA	NERITA POLITA
" TIGRIS	NERITINA GRANOSA
" VITELLUS	OLIVA AURICULARIA
DELPHINULA LACINIATA	OLIVA CARNEOLA
DOLIUM GALEA	" EPISCOPALIS
DOLIUM OLEARIUM	" ERYTHROSTOMA
" PERDIX	" GIBBOSA
" POMUM	" GUTTATA
FASCIOLARIA FILAMENTOSA	" MAURA
FISSURELLA ERRATICA	" OLYMPIADA
FUSUS TUBERCULATUS	" SANGUINOLENTA
HALIOTIS ASININUS	OLIVA, 2 sp. ind.
HALIOTIS CHRACHERODI	OSTREA CRISTATA
" IRIS	OVULUM OVUM
" OVINA	OVULUM VERRUCOSUM
" PULCHERRIMA	PECTEN DISLOCATUS
" RUFESCENS	PECTEN PLEURONECTES
HARPUS MINOR	PECTEN SINENSIS
HARPUS NOBILIS	PINNA FLABELLUM
HARPUS VENTRICOSA	PINNA NIGRA
HELIX HEMASTOMA	PINNA, sp. ind.
HELIX LAMARCKII	PLACUNA SELLA
" RHEA	PTEROERAS BYRONIA
" ROISSIANA	PTEROERAS CHIRAGRA
HELIX, sp. ind.	" LAMBIS
LITTORINA CORONARIA	" SCORPIO
LUCINA EXASPERATA	PTEROERAS (young).
LUTRARIA CAPAX	PTEROPERNA, sp. ind.
MACTRA BRAZILIANA	PURPURA APERTA
MALLEUS ALBUS	PURPURA ARMIGERA
MALLEUS ANATINUS	" CHOCOLATA
MALLEUS VULGARIS	" HIPPOCASTANUM
MARGARITIFORA MARGARITIFERA	" MELONES
MITRA EPISCOPALIS	" PATULA
MONOCERAS CRASSILABRUM	" PERSICA
MONOCERAS IMBRICATUM	" PICA
MONODONTA, sp. ind.	PURPURA (PISANIA) SERTUM
MUREX ADUSTA	PURPURA, 2 sp. ind.
MUREX BRANDARIS	PYRULA VENTRICOSA
" ELONGATUS	RANELLA BUFONIA
" INFFLATUS	RANELLA VENTRICOSA
" RUBIGINOSUS	RICINULA ARACHNOIDES
" TERNISPINA	RICINULA HORRIDA
" TRIGONULUS	SANGUINOLARIA RUGOSA

<i>SCARABUS CASTANEUS</i>	<i>TROCHUS CÆLATUS</i>
<i>SCARABUS LESSONI</i>	" <i>GEORGIANUS</i>
" <i>POLLEX</i>	" <i>GRANOSUS</i>
" <i>STRIATUS</i>	" <i>INTEXTUS</i>
<i>SOLARIUM PERSPECTIVUM</i>	" <i>MACULATUS</i>
<i>SONDYLUS GIGANTEUS</i>	" <i>MARMOREUS</i>
<i>SONDYLUS</i> , 2 sp. ind.	" <i>NILOTICUS</i>
<i>STROMBYLUS AURIS-DIANÆ</i>	" <i>OBELISCUS</i>
<i>STROMBYLUS CANARIUM</i>	" <i>TUBIFERUS</i>
" <i>EPIDROMIS</i>	<i>TURBO ARGYROSTOMA</i>
" <i>FLAVIDUS</i>	<i>TURBO ATER</i>
" <i>GIBBERULUS</i>	" <i>CHRYSSOSTOMA</i>
" <i>ISABELLA</i>	" <i>COOKII</i>
" <i>LATISSIMUS</i>	" <i>CRASSUS</i>
" <i>LENTIGINOSUS</i>	" <i>LAJONKAIRII</i>
" <i>LUHNANUS</i>	" <i>MARGARITACEUS</i>
" <i>PLICATUS</i>	" <i>PETIOLATUS</i>
" <i>SUCCINCTUS</i>	" <i>PORPHYRITES</i>
" <i>URCEUS</i>	" <i>PULCHER</i>
" <i>VITTATUS</i>	" <i>RADIATUS</i>
<i>STRUTHIOLARIA NODULOSA</i>	" <i>RUGOSUS</i>
<i>TAPES</i> , sp. ind.	" <i>SAXOSUS</i>
<i>TELLINA REMIES</i>	" <i>SMARAGDUS</i>
<i>TELLINA SCOBINATA</i>	" <i>SPARVERIUS</i>
<i>TEREBRA CRENULATA</i>	" <i>TESSELATUS</i>
<i>TEREBRA DIMIDIATA</i>	" <i>VERSICOLOR</i>
" <i>MACULATA</i>	<i>TURRITELLA DUPLICATA</i>
" <i>OCULATA</i>	<i>VENUS CREBRISULCA</i>
" <i>STRIGATA</i>	<i>VENUS GEOGRAPHICA</i>
" <i>SUBLATA</i>	" <i>PETITII</i>
<i>TRITON ANUS</i>	" <i>PICTA</i>
<i>TRITON CHLOROSTOMA</i>	" <i>VIRGINEA</i>
" <i>LAMPAS</i>	<i>VENUS</i> , 5 sp. ind.
" <i>LINEATUS</i>	<i>VERMETUS</i> , sp. ind.
" <i>PILEARIS</i>	<i>VOLUTA ANCILLA</i>
" <i>RUDIS</i>	<i>VOLUTA ETHIOPICA</i>
" <i>TUBEROSUS</i>	" <i>TUBERCULATA</i>
" <i>VARIEGATUS</i>	" <i>VESPERTILIO</i>
<i>TROCHUS ACUTUS</i>	



(D.)

CONTRIBUTIONS TO PALEONTOLOGY ;

COMPRISING

DESCRIPTIONS OF NEW SPECIES OF FOSSILS,

FROM THE

Upper Helderberg, Hamilton and Chemung Groups.

BY JAMES HALL.

* * THE descriptions of the following species of fossils, from page 29 to page 112, were printed and published in advance of this Report, and at the dates indicated at the bottom of the pages.

GASTEROPODA.

GENUS PLATYCERAS (CONRAD).

PLATYCERAS (ORTHONYCHIA) DENTALIUM (n. s.).

SHELL slender, elongate, subspiral, making about half of one volution in the length of one and a half inches, somewhat flattened obliquely from the base to near the apex : section subelliptical, giving the diameters about as two to three. The middle of the flattened sides are often a little concave, rounded towards the apex, which is minute and abruptly incurved.

SURFACE marked by transverse or concentric striæ of growth, and by longitudinal sulci which are conspicuous on the lower part of the shell, and give to the transverse striæ a strongly undulated character. Aperture oblique.

In a specimen one inch and a half in length, the greatest diameter is less than half an inch.

This species is much more slender and less distinctly spiral than the *P. tortuosus* of the Oriskany sandstone, and differs in the same features more extremely from any of the species known in the Lower Helderberg group.

Geological formation and locality. In the limestone of the Upper Helderberg group : near Williamsville and Buffalo, N.Y.

PLATYCERAS (ORTHONYCHIA) SUBRECTUM.

ORTHONYCHIA (genus proposed) : Report Fourth District New-York Geological Survey, pag. 172, no. 68, f. 3.

PLATYCERAS SUBRECTUM. Twelfth Annual Report of the Regents on the State Cabinet, p. 18.

SHELL unguiform, elongate, subspiral, making not more than a quarter of a volution in the length of three-fourths of an inch, below which it is entirely straight. Apex minute, abruptly incurved, solid, nearly cylindrical for a short distance below the apex and gradually compressed, becoming a little concave on the posterior side : aperture somewhat oblique.

SURFACE marked by concentric striæ, which are sometimes crowded together, forming ridges or wrinkles.

This species is more robust and rapidly expanding than the *P. dentalium*, and is more enrolled at the apex ; but it does not show the longitudinal sulci and ridges which are characteristic of *P. dentalium*.

This is the species figured in the Report of the Fourth Geological District, and the form typical of those for which I proposed the generic name *ORTHONYCHIA*. The apex or nucleus of this and of other species is usually solid, and, when the shell is removed, the casts show a rounded obtuse apex which is sometimes scarcely incurved.

Geological formation and locality. In the limestone of the Upper Helderberg group : near Buffalo and Williamsville, N.Y.

PLATYCERAS ATTENUATUM (n.s.)

SHELL elongato-ovate or conically subovate, with a slender apex which makes about a single volution, and below which the body-whorl becomes rather abruptly inflated, and thence gradually expands to the aperture, which is very oblique; the anterior side of the peristome being much more extended.

SURFACE marked by crowded undulating concentric striæ and longitudinal irregular and undefined folds, which vary greatly in different specimens : these become more distinctly marked as plications near the aperture. Peristome sinuous, with numerous indentations corresponding to the folds upon the surface.

In many specimens the surface is marked by abruptly undulating plications without distinct folds, or with the folds obscurely developed. Length of shell about one inch, with the greatest diameter a little less than half an inch.

This species is distinguished by the abrupt contraction of the upper part of the shell of the body-whorl, or just below the curvature ; while the apex, consisting of a single minute volution, is abruptly contracted, and proportionally more slender than in most other species. It somewhat resembles the *P. clavatum* of the Lower Helderberg group.

Geological formation and locality. In the shales of the Hamilton group on the shores of Seneca and Cayuga lakes, Geneseo, Moscow, and other places in Western New-York.

PLATYCERAS (ORTHONYCHIA) CONCAVUM (n.s.).

SHELL robust, subspiral, slender, gradually expanding above and more rapidly dilating towards the aperture, which is subquadri-lateral, with the peristome strongly undulated.

[August,

The specimen is imperfect at the apex, and the lower portion makes less than half a turn from the aperture in the length of about two inches : apex unknown. Anterior side of the body-volution convex and ventricose : posterior side distinctly concave; the right side moderately convex, and the left side rounded. Surface marked by concentric undulating striæ.

The length of the fragment is two inches; the aperture, from the posterior to the anterior side, is about seven-eighths of an inch, and the transverse diameter a little more than one inch.

This species resembles the *P. tortuosum* of the Oriskany sandstone, but is more robust and more rapidly expanding towards the aperture, which is much less oblique than in that species, while the concave posterior and prominent anterior side are distinguishing features.

Geological formation and locality. In the limestone of the Upper Helderberg group : Williamsville, Erie county, N.Y.

PLATYCERAS CONICUM (n.s.).

SHELL erect, conical, the minute apex closely incurved? Body-volution entirely straight, with broad undefined longitudinal ridges and depressions, which become more distinct towards the aperture : height of the shell a little greater than the width of aperture, which is a little longer than wide. Surface marked by concentric undulating striæ which become sublamellose towards the aperture, and are sometimes closely crowded and wrinkled with numerous knots or nodes. Peristome deeply sinuous ; the width from the anterior to the posterior side a little greater than the transverse diameter.

The length of the shell is one and a half inches or more, with the aperture a little less.

This species approaches the *P. pyramidatum* of the Lower Helderberg group, but is less elongate, the peristome is more sinuous, and the indication of longitudinal ridges and depressions is more distinct : the crowded wrinkled and nodose striæ are likewise a distinctive feature.

Geological formation and locality. In the Hamilton group, Ontario county ; and in the Upper Helderberg limestone at Darien and Williamsville, N.Y.

PLATYCYERAS THETIS (n.s.).

SHELL obliquely arcuate from the base, with the apex incurved, and making scarcely a single minute volution; gradually expanding from the apex to near the aperture, which is sometimes more abruptly spreading. The back of the body-whorl is prominent, and a little flattened on the left side; while the right side, from one-third to one-half the length, is sometimes marked by two or three longitudinal folds. Aperture a little oblique, nearly round or approaching to quadrangular, with the peristome sinuous.

SURFACE marked by fine closely arranged lamellose striæ, which are abruptly undulated on all parts of the body of the shell.

In many, and perhaps nearly all specimens, the body of the shell, along a line a little to the left of the dorsum, is marked by an abrupt curvature of the striæ, indicating a notch in the margin of the peristome. This line is sometimes marked by a narrow prominent band, not unlike the band in *PLEUROTOMARIA*.

This species differs from *P. attenuatum*, in being arcuate from the base, in the gradual attenuation towards the apex, and the more closely incurved nucleus.

Geological formation and locality. In shales of the Hamilton group: at Moscow, York, and Ontario county; and in limestone of the Upper Helderberg group, Albany county, N.Y.

PLATYCYERAS ERECTUM.

ACROULIA ERECTA: Geol. Report 4th District New-York, p. 174, and fig. 6, p. 172.

This species, originally described from specimens in the Corniferous limestone, occurs also in the Hamilton group. The spire at the apex is closely enrolled for about one and a half volutions, beyond which the body-volution becomes somewhat rapidly expanded, with the aperture often spreading. The specimens are often more arcuate than the figure in the Geological Report, and the aperture oblique, with the peristome sinuate. The surface is marked by closely arranged revolving lamellose striæ, which, upon the lower half of the body-volution, are abruptly arched along narrow bands corresponding with former sinuosities of the aperture.

Geological formation and locality. In the limestone of the Upper Helderberg group, Williamsville and near Buffalo; and in the Hamilton group, at York, Moscow, Darien, and other places.

[August,

PLATYCERAS CARINATUM (n. s.).

SHELL obliquely subconical or subpyramidal; the nucleus or apex minute, and making from one to one and a half volutions which are vertically compressed, and below which the body-volution is abruptly expanded; the dorsum angular, or marked by an angular carina which often becomes double in old shells, or is rounded on the summit. This angularity or carina indicates the existence of a notch or sinus in the peristome; and sometimes there may have been two such sinuosities close together, giving the double carina. There is usually a depression along one or both sides of the carina, with longitudinal folds on one or both sides, which become more strongly developed towards the aperture, and are very conspicuous in old shells: the right side is more expanded than the left, and in some well-preserved specimens is nearly twice as wide. Aperture very oblique and subtriangular, and the peristome sinuous.

SURFACE marked by fine closely arranged undulating striae of growth, which are not lamellose.

This species is very well marked in its dorsal carina and rapidly expanding body-volution, which spreads always more on the right side. The surface, though striated, is close, and the shell compact; differing in this respect from most of the other species. Having examined more than a dozen individuals, from the length of less than half an inch to that of an inch and a half, the characters mentioned are preserved in a marked degree in all of them. In the largest specimens, the aperture is a little more than an inch in its greatest diameter, and nearly equal to the height of the shell.

Geological formation and locality. In limestones of the Upper Helderberg group: Helderberg mountains and Williamsville, N.Y., and Sandusky, Ohio; in the Hamilton group, at Eighteen-mile creek, Darien, Pavilion, Canandaigua and Seneca lakes.

PLATYCERAS BUCCULENTUM (n. s.).

SHELL ventricose, obliquely subovoid: apex extremely attenuate, making one to two closely enrolled volutions, with a gently expanding diameter, and below this more abruptly expanding and becoming very ventricose in the middle and below, spreading

more upon the right side than upon the left, and the peristome near the posterior side swelling out into a distinct pouch-like projection, with two or three rounded folds or semiplications which give a deeply sinuous outline to the margin. Aperture subovate, and sinuate on the right posterior side. Peristome slightly sinuous, and spreading on the posterior side partially over the preceding volution.

SURFACE marked by fine closely arranged concentric striae, undulated towards the margin of the aperture; with obsolete revolving bands or lines, giving a waved aspect to the surface.

This species is more ventricose than any of those described in this paper. The character of apex, and the widely expanded body-volution, resemble in some degree the *P. ventricosum* of the Lower Helderberg; but the first volution is more slender and the spire less elevated, while the lateral pouch-like expansion is a distinctive feature. This shell is also much smaller, rarely more than an inch high, while the greatest diameter of the aperture is about equal to the height.

Geological formation and locality. In shales of the Hamilton group at York and Moscow, Livingston county, N.Y.

PLATYCERAS SYMMETRICUM (n. s.).

SHELL elongate, subovoid, arcuate, incurved nearly in the same plane, the apex making about a single volution, below which the shell is somewhat abruptly expanded: expansion about equal on the two sides of the dorsum, which is more prominent and sometimes marked by a ridge. Aperture very oblique: margin of the peristome sinuate, and, on the posterior side, distant from the spire.

SURFACE marked by concentric undulating striae, and longitudinally by obscure interrupted ridges, which, on some parts of the older shells, become regular and uniform with a narrow groove between.

This species is well marked by the equilateral expansion on each side of the dorsum, and by the volution of the apex being nearly in the same plane. The longitudinal ridges are more strongly marked, and of a different character from those of *P. bucculentum*.

Geological formation and locality. In the Upper Helderberg limestone at Darien, and in the Hamilton group at Darien, York, and Canandaigua lake.

[August,

PLATYCERAS RICTUM (n.s.).

SHELL very depressed and obliquely subconical, the width equalling or exceeding the height. Apex minute and enrolled to about one and a half turns, when it abruptly expands, spreading more upon the right posterior side and becoming elongated in front, giving a peculiar oblique form to the shell. Aperture obliquely ovate : peristome entire, or with a slight sinuosity on the left posterior side; posterior side not contiguous to the preceding volutions.

SURFACE marked by fine undulating concentric striae : a few broad undulations mark the surface longitudinally. Width of aperture about an inch and a quarter, and a little greater from the anterior to the posterior margin : height about an inch.

This species is very expanded, with surface striae differing from any of the preceding.

Geological formation and locality. In shales of the Hamilton group : Ontario county, N.Y.

PLATYCERAS CYMBIUM (n.s.).

SHELL subangularly ovoid. Apex minute, making one or more turns, below which the shell is abruptly expanded; the back flattened or but moderately convex, while the right side is distinctly flattened, making an obtusely angular ridge between the side and back of the shell, and sloping more gently on the left side. Aperture extremely spreading.

SURFACE marked by transverse striae, which are undulated on the dorso-lateral angle. Shell lamellose striate, with a few strong nodes or spines : these, in the specimens examined, are broken so that their extent is unknown.

This species is characterized by the broad expansion of the aperture, the flattened dorsum and right or upper side, giving an obtuse dorso-lateral angle.

Geological formation and locality. In Upper Helderberg limestone, at Clarence-hollow, N.Y.

PLATYCERAS FORNICATUM (n.s.).

SHELL obliquely subhemispherical, or very depressed obliquely conical. Apex minute, distinctly spirally enrolled for about one turn and a half, below which it expands, so that in the extent of an inch and a half along the dorsum to the front it has acquired 1861.]

an aperture of about an inch and a half in diameter in both directions; the peristome having a little projection in the postero-lateral margin. The upper side of the spire, for the first one and a half volutions, is flattened; the angle continuing into the broad expansion of the body-whorl, and dying out before reaching the margin. Aperture nearly round or round-ovate: peristome scarcely sinuous.

SURFACE marked by fine concentric striae, with a few strong spines upon the body-volution.

This species is conspicuously different from the *P. dumosum*, in the shorter and comparatively more expanded form; while the few scattered spines appear to be without order on the surface. A variety, which may belong to this species, has a less expansion of aperture, an obliquely ovoid form, less attenuate apex, and greater proportionate height.

Geological formation and locality. In limestone of the Upper Helderberg group: Williamsville, and near Carlisle. The varieties are from Darien, N.Y.

PLATYCERAS CRASSUM (n. s.).

SHELL large, irregular, obliquely subovate, arcuate, somewhat broadly flattened on the back, with several more or less strongly defined longitudinal folds, strongly incurved at the summit, the apex making one or two volutions: the body-whorl spreads more on the right side, while the left posterior side is often flattened or depressed, with a greater expansion or sinuosity immediately behind. Aperture very oblique, subquadrangular or irregularly rounded, with a deep sinus on the right anterior margin; the peristome sinuous.

SURFACE marked by concentric undulating lamellolose striae: shell thick, raised at unequal intervals into nodes and interrupted ridges.

The length of large specimens is two and a half inches, and height a little less than two inches; while the transverse diameter of the aperture is from one and a half to two inches, and the longitudinal diameter a little less.

This shell is remarkable for its great strength and thickness: it is more oblique than the *P. rarispinum*, and expands less rapidly, while the fold or carina near the summit is on the left side.

Geological formation and locality. In the Upper Helderberg limestone: Helderberg mountains, Albany and Schoharie counties.

PLATYCYERAS AMMON (n. s.).

SHELL depressed, suborbicular, making about two volutions, with the summit of the spire on the same plane or a little above the plane of the outer volution. Spire small : volutions contiguous throughout their whole extent, very gradually expanding; the last half of the body-whorl ventricose. Aperture large, subovate, deeply sinuate on the left anterior margin.

SURFACE marked by fine concentric undulating striæ, which are deeply arcuate on the back of the last volution, corresponding to the sinuosity of the aperture; the striæ aggregated in folds or ridges, giving an irregular or undulating surface to the shell.

This species has the form of *PLATYOSTOMA*; but the peristome shows no columella, and presents a wide umbilicus. The length of the largest specimen, from the outer margin of the aperture to the opposite side of the volution, is more than three inches : the longitudinal diameter of the aperture is nearly two inches ; the width, a little less.

Geological formation and locality. In the Corniferous limestone : Darien, N.Y. I have also seen the same from Port Colborne, Canada West.

PLATYCYERAS DUMOSUM (CONRAD).

P. dumosum : CONRAD, Ann. Rep. on the Palæontology of New-York, 1840, p. 205.

This shell, in its full size, attains a length of two and a half inches, with the entire surface covered with strong spines sometimes two inches in length. In well-marked specimens these spines are arranged in diagonal rows across the body of the shell, and show a nearly regular quincunx order. One specimen shows the bases of ninety of these spines, and, from the extent of the shell, the whole number must have been more than one hundred.

Mr. CONRAD's description is as follows : "Shell covered with thick tubular spines, arranged in longitudinal rows ; margin of aperture waved ; 'volutions free.' He remarks that 'in some varieties the spines are comparatively few.' In some specimens of more than half the full size, there are not more than fifteen or twenty spines ; and in all those with few spines, the expansion of the body-whorl is much less abrupt, while they rarely attain more than half the size of the large typical forms. The number of volutions in the smaller forms is fully equal to the larger ones ; being two or more, with the last one quite free.

Since this form is so distinct and constant, I propose to designate it as a variety.

PLATYCERAS DUMOSUM, var. RARISPINUM.

SHELL consisting of about two volutions; the apex closely enrolled for more than one volution, and sometimes the volutions are contiguous nearly to the aperture: for one and a half volutions the apex is slender and gently expanding, the body-volution expanding more rapidly below and becoming moderately ventricose, depressed on the dorsum. Aperture somewhat round-oval.

SURFACE marked by wrinkled concentric striæ, which are strongly undulated at the bases of the spines. Spines scattered, comparatively strong, from five to fifteen or seventeen on shells from the medium to the largest size.

The larger shells have a length of less than two inches, with a height of one and a half inches; the greatest diameter, one inch and a quarter.

This shell is never so ventricose as the *P. dumosum* proper, and the dorsum is flattened, while in that it is always convex. The *P. dumosum* is a rare shell, while the smaller variety is not uncommon.

Geological formation and locality. In limestone of the Upper Helderberg group: Helderberg mountains, and in Oneida, Onondaga and Erie counties, N.Y.; Canada West; Ohio, and Falls of the Ohio river.

The *P. dumosum* cited by Mr. CONRAD as occurring in the Hamilton group, is a variety of more ventricose form than the one here described, and has fewer spines. For this I propose the name *Platyceras sparsum*.

PLATYCERAS ECHINATUM (n.s.).

SHELL small, obliquely subovoid. Apex closely incurved for about one volution; the body-whorl, from one-half to one volution, is ventricose, rapidly expanding from the first volution, giving an obliquely conical form. Aperture nearly circular or round-oval: peristome sinuate, the lines of growth and fine striæ conforming in direction to the outline of the margin. Remains of revolving striæ are sometimes preserved, where the shell is not exfoliated. Besides the concentric and less conspicuous revolving striæ, the surface is studded with numerous strong nodes or spines; the latter preserved only when the shell is imbedded in soft shale, and quite separable from the rock: when imbedded in limestone, the spines and exterior are exfoliated with the matrix.

In this species the shell varies from half an inch to an inch and a quarter; and in a large specimen, the greatest diameter of aperture is one inch.

Geological formation and locality. In shales of the Hamilton group : Moscow and Ludlowville ; and in Tully limestone? at Ovid, N.Y.

PLATYCYRAS ARGO (n. s.).

SHELL varying from subdiscoid to obliquely subovoid, with body-whorl extremely ventricose : nucleus minute, with the apex closely enrooled for about two volutions, beyond which it expands more or less abruptly; the last volution nearly or quite in contact with the preceding one. The body of the shell is often obtusely triangular, becoming rounded towards the aperture, and sometimes for nearly half the length of the body-whorl. Aperture round or round-ovate, sometimes approaching to quadrangular, broadly sinuate on the right side and deeply sinuate on the left side, where the peristome is sometimes strongly reflexed, forming an apparent columellar lip.

STRUCTURE of the shell lamellose, as in the CEPHALOPODA, with a nacreous lustre; the exterior surface marked by fine revolving striae, with distant stronger striae or ridges, and cancellated by coarse concentric undulating striae which are bent backwards upon the somewhat regular ridges, presenting several bands similar to the single one in PLEUROTOMARIA.

This species is remarkable for the peculiar lamellose structure throughout, presented on fracture or exfoliation, and which gives it the character of a NAUTILUS or BACULITES of the Secondary rocks. When the apex remains covered, it might be mistaken for a reversed shell ; the depression on the upper side of the spire being deeper and more abrupt than on the lower side, as the plane of the first volutions is below the centre of the shell, and the spire is shown only in the first or first and second volutions.

Geological formation and locality. In the Upper Helderberg limestones: Williamsville, Erie county, N.Y.

GENUS PLATYOSTOMA (CONRAD, 1842).

See Twelfth Annual Report of the Regents on the State Cabinet of Natural History, p. 20.

PLATYOSTOMA LINEATA.

Platyostoma lineata [?] : CONRAD, Jour. Acad. Nat. Sciences, Vol. viii, pa. 275,
pl. 17, f. 7.

“ Transversely subovate, with wrinkled reticulated striæ : aperture “ orbicular ; spire depressed, or slightly elevated above the top “ of the body-whorl.”

Although no geological position is assigned to this species, and the figure does not correspond with the greater part of the specimens examined, I am still inclined to regard this as the common form of the Hamilton group, of which I have seen at least two hundred individuals.

The form is subovate, approaching to subglobose : the spire is always elevated above the body-whorl, though varying in degree. The shell consists of four or five volutions when entire ; but it rarely happens that more than three are preserved, the apex usually being imperfect. The outer volution is very ventricose and regularly convex, a little depressed (but not canalliculate) below the suture line : aperture orbicular in perfect specimens ; outer lip thin, with a sharp entire margin ; columellar lip thickened, folded, and reflexed over the umbilicus, which, in adult specimens, is entirely closed. Surface marked by fine, nearly equidistant, thread-like, revolving striæ, which are cancellated by fine concentric striae of about the same strength, but unequally distant. Sometimes the striae are bent abruptly backwards upon the back of the shell. In well-preserved specimens, the surface is beautifully cancellated ; and in the worn and partially exfoliated specimens, some remains of these surface markings are usually visible.

This species approaches in surface characters the *P. turbinata* of the Schoharie grit and Helderberg limestone ; but the spire is never so depressed, and the aperture never so straight above, nor so extended on the lower side. It has usually a length of one to two inches. A well-formed individual measures one and a half inches long, with a vertical height of about one inch : another specimen, preserving its proportions free from compression, has a length of two inches, with a vertical height from base of aperture to apex of less than one and a half inches. A single extravagant specimen has a length of three inches, with a width of aperture of nearly two inches ; the body volution, for a distance of two inches from the aperture, is more than usually straight, and marked by crowded and unequal concentric striae without revolving striae, while these are preserved on the upper part of the shell. A cast of a specimen in the Corniferous limestone from Batavia has a length of more than three inches, while the vertical diameter of the aperture does not exceed one inch and a half ; and the specimen bears no evidence of compression. The specimens which I have seen from Ohio and the West are casts in limestone, and do not preserve the striae.

Geological formation and locality. In the Upper Helderberg limestones throughout the limestone range from east to west in New-York, and in the Hamilton group in the western part of the State.

[August,

PLATYOSTOMA STROPHIUS (n. s.).

SHELL obliquely ovoid. Spire ascending, composed of about three or four volutions : apex minute; volutions very gradually expanding above; the body-whorl ventricose, somewhat depressed-convex on the side, and sloping downwards rather than swelling out in a rotund form; the upper volutions standing out prominently above the last one. Suture-line narrow, even, and sometimes appearing as very narrowly and deeply canaliculate.

SURFACE marked by fine concentric striæ, which are sometimes crowded into wave-like fascicles or undulating folds, and sometimes abruptly bent forwards near the base. In some parts, or upon some specimens, these striæ are very regular and even, as in *STROPHOSTYLUS*. Aperture ovate, and, in one specimen, with a sinus near the base.

This species is less ventricose than the *P. lineata*, and the spire much more elevated, while no revolving lines have been observed. In many respects it resembles *STROPHOSTYLUS*, but the aperture has not been entirely determined.

Geological formation and locality. In the Corniferous limestone :

STROPHOSTYLUS UNICA (n. s.).

SHELL suborbicular; height and length about as three to four.

Spire consisting of three or four volutions; the apex moderately elevated above the outer volution. Suture close, and the volutions evenly convex upon the upper side. Body-whorl ventricose, evenly and equally rounded upon the back. Aperture subovate, a little extended at the lower side and slightly straitened on the posterior side : outer lip regularly curved ; columellar lip thickened and slightly twisted, the fold being near the upper part of the lip.

SURFACE marked by fine crowded concentric striæ, which are broadly curved backwards on the dorsum : shell very thick. At one point where the shell is broken away, the surface, within the cavity, is marked by revolving striæ.

The slight thickening and fold in the columellar lip distinguish this as a *STROPHOSTYLUS*, while there is no indication of an umbilicus. The form of this shell differs little from *Platyostoma lineata*; but the even convexity of the spire, and usual absence of revolving striæ, are distinguishing external features.

Geological formation and locality. In Schoharie grit : at Schoharie.
1861.]

PLEUROTOMARIA ARATA (n.s.).

SHELL depressed suborbicular. Spire moderately elevated : volutions three or four, gradually enlarging, the outer half of the body-volution being ventricose. Aperture somewhat transverse. SURFACE marked by strong distant angular ridge-like striæ parallel to the finer lines of growth; a strong band marking the periphery of the shell.

This species is abundant in the Schoharie grit, in the condition of casts of the interior : individuals are rarely found, retaining the shell in greater or less perfection ; and some of the stronger markings are not unfrequently preserved on the casts, or as impressions of the exterior upon the surrounding matrix. The diameter of the shell is from one inch to two and a quarter inches, and the vertical height in the largest specimens is about an inch and a quarter. The shell appears to have been distinctly umbilicate.

Geological formation and locality. In the Schoharie grit : Helderberg mountains and Schoharie.

PLEUROTOMARIA LUCINA (n.s.).

Euomphalus? rotundus : Geol. Report 4th District New-York, 1843, p. 172, f. 4.
or *Pleurotomaria rotundata* of MUNSTER.

SHELL suborbicular. Spire elevated : volutions about four; apex minute. Volutions gradually expanding to the last one, which becomes very regularly ventricose, with the aperture expanded and nearly round, or extended on the lower side with a shallow notch on the anterior margin. Upper side of the volutions very symmetrically convex : suture neatly defined, slightly canalicate. Lower side of the body-volution convex in the middle, and gradually depressed into the umbiliens.

SURFACE beautifully cancellated by concentric and revolving striæ, which, in many specimens, are of equal strength. Periphery marked by a moderately wide band, on which the striæ are turned abruptly backwards : this band is limited by stronger striæ or narrow ridges, and sometimes one or two slender revolving striæ are within the extent of the band.

This species is well marked by its symmetrically rotund form and the regular convexity of the volutions, even in casts of the interior when not compressed. There is some variety in the surface-markings of specimens which appear all to belong to this species. The concentric striae are some-

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times much coarser than the revolving striae; and finer striae are implanted between the coarser, and do not reach the suture-line. In old specimens, the revolving band is a quarter of an inch in length. The species has had a wide geographical distribution, and its vertical range is not less than one thousand feet. A very symmetrical specimen has a diameter of a little more than two inches, and is nearly an inch and three-fourths in height. Another specimen, which has suffered some compression, has a breadth of about three inches, with nearly the same height of spire.

Geological formation and locality. In the Corniferous limestone : Helderberg mountains, Williamsville, Clarence-hollow, N.Y.; and Falls of the Ohio river. In the Hamilton group : York, Moscow, Genesee, Skeneateles lake, etc., N.Y.

PLEUROTOMARIA DORIS (n.s.)

SHELL very depressed-conical, the elevation of the spire being about two-thirds the width across the base of the shell. Volutions three or four, very gradually expanding, their elevation above the suture line being greater than the width exposed : body-volution moderately ventricose and rounded above; the periphery a little contracted vertically, and the lower side rounded and expanded more abruptly towards the aperture, gently depressed towards the centre, which is partially umbilicate. Aperture nearly circular. SURFACE marked by strong revolving striae, which are crossed by fine and less conspicuous concentric striae, giving sometimes a denticulate character at the crossing of the two series. Shell of moderate thickness. Suture neatly defined, not canaliculate.

This species is less rotund than the *P. lucina*; the spire is more elevated, and the revolving striae proportionally stronger.

Geological formation and locality. In the Schoharie grit, Schoharie; and in the Corniferous limestone, Clarence-hollow, Erie county, N.Y.

PLEUROTOMARIA UNISULCATA (CONRAD).

Pleurotomaria unisulcata : CONRAD, Jour. Acad. Nat. Sciences, Philadelphia, 1842, pag. 271, pl. 16, f. 9.

" Short-fusiform : spire conical-depressed; upper surface of the
 " large volution slightly concave from the outer margin to a ca-
 " rinated line which borders a transversely rugose sulcus; an-
 " other, but more obtuse line, margins the suture; penultimate
 " whirl rounded, obtusely carinated at the suture; base nearly
 1861.]

"rectilinear towards the labrum, slightly convex above the aperture."

Until the present time, I have failed to recognize in our limestones any species of *PLEUROTOMARIA* that could be identified with the *P. unisulcata* of CONRAD. I have now before me an imperfect specimen which has the form and proportions of spire and body-whorl, with a strongly banded suture, represented in the figure of *P. unisulcata*. The apex is imperfect, and the upper side of the body-volution a little more flattened; the aperture also is imperfect, but has the form given in the figure of CONRAD. Some portions of the shell show concentric and revolving striae; but the back of the outer volution is too imperfect to show any spiral band, though the bending of the striae indicates a sinuosity in the dorsal angle of the peristome.

Geological formation and locality. In Upper Helderberg limestone at Schoharie.

PLEUROTOMARIA LINEATA.

Turbo lineata : HALL, Geol. Report 4th District New-York, 1843, p. 193, f. 1.

SHELL turbinate. Spire ascending, higher than wide. Volutions four or five, regularly and evenly convex, gradually expanding to the body-whorl which is ventricose, rounded below and concave in the middle: umbilicus small or none. Aperture round. mm SURFACE marked by equal regular revolving striae on the upper and lower sides of the volutions, which are crossed by fine concentric striae: these, on the periphery, are bent abruptly backwards along a broader space than is usual between two revolving striae, and sometimes there is a distinct band upon the periphery.

This species varies in form and proportions, from compression and accident, so that some specimens are proportionally much more elevated than others. In the soft calcareous shales of the Hamilton group, this fossil usually occurs in the form of casts, and it is not unfrequently covered by encrusting coral or bryozoa. In its greatest height, the shell reaches nearly an inch. A very symmetrical specimen measures about seven-eighths of an inch in height, with an equal breadth.

Geological formation and locality. In the calcareous shales of the Hamilton group; Seneca and Cayuga lakes.

PLEUROTOMARIA CAPILLARIA (CONRAD).

Pleurotomaria capillaria : CONRAD, Jour. Acad. Nat. Sciences, Philadelphia, 1842, Vol. viii, pa. 271, pl. 16, f. 11.

" Turrited volutions slightly angulated below the middle, with " spiral carinated lines; the second and third lines from the " suture, on the upper part of the volutions, more distant from " each other than from the adjoining striæ : upper part of the " volutions very obliquely rectilinear. Surface with equal sharp " lines which cross the volutions obliquely."

In the coarser shales of the Hamilton group, there is a species of PLEUROTOMARIA corresponding to the figure given by Mr. CONRAD. The intermediate revolving striæ on the upper side of the volution are faintly defined, and may become obsolete : the volution is a little flattened upon the upper side, with a prominent band upon the periphery.

In the limestone of the Upper Helderberg, below the Hamilton group, there are specimens of PLEUROTOMARIA of nearly the same form and character as those here mentioned in the Hamilton group ; but the species is more slender and the body-whorl is proportionally more ventricose than those in the Hamilton group, and the concentric striæ are much more closely arranged. This variation may be due to difference of physical conditions, and not be of specific importance.

Geological formation and locality. In the Hamilton group at Cazenovia and Skeneateles, etc.

PLEUROTOMARIA TRILIX (n. s.).

SHELL subconical, higher than wide, consisting of three or four volutions, the first of which are small; the last one ventricose and angular on the periphery, and concave below, with a distinct umbilicus.

The surface is marked by concentric striæ, which are closely arranged and little elevated. On the last volution there is a distinct carina just below the suture, and the periphery is triply carinate, enclosing two depressed bands, upon which the concentric striæ are abruptly bent backwards from the aperture. At a distance below the periphery equal to that between the upper carina and the central one, are one or two carinate revolving lines.

This species, though observed only in imperfect specimens, is readily distinguished from any others of the group.

Geological formation and locality. In the shales of the Hamilton group: Seneca lake shore, N.Y.

1861.]

PLEUROTOMARIA SULCOMARGINATA (CONRAD).

Pleurotomaria sulcomarginata : CONRAD, Jour. Acad. Nat. Sciences, Philadelphia,
Vol. viii, pa. 272, pl. 16, f. 13.

“ Trochiform : outer margin of the large volution bicarinated, with
“ an intermediate sulcus; volutions with two distant spiral lines,
“ and crossed by oblique striae.”

This is the most common species of PLEUROTOMARIA in the Hamilton group, occurring in all places east of Seneca lake, and often abundant in the coarser shales of Madison county. To the west of Seneca lake it is very restricted in its vertical range, and is comparatively rare. The form is usually depressed-trochiform, though sometimes seven-eighths of an inch high, with a diameter of one inch. The retral bending of the sharp concentric striae, the distinct carina just above the suture in the upper volutions, and the spiral band on the angular periphery, are distinguishing features. The casts are, however, often rounded on the periphery ; and some specimens in this condition from Maryland measure one inch and a half in diameter and one inch and three-eighths in height, and consist of about five volutions.

PLEUROTOMARIA ROTALIA (n. s.).

SHELL small, depressed-trochiform. Spire consisting of about four volutions. Apex minute, the volutions gradually expanding to the aperture : slope of the spire from the apex to the periphery nearly in the same plane, being very slightly convex. Aperture subquadrate.

SURFACE very finely and closely striate : striae not prominent; periphery marked by a narrow band ; suture-line depressed and narrowly canaliculate.

This species has nearly the form of *P. sulcomarginata*; but the band on the periphery is scarcely depressed, there is no carination above the suture-line, and there are no sharp elevated striae. The largest specimens seen are half an inch in diameter and three-eighths of an inch in height.

Geological formation and locality. In the compact shale or calcareous rock of the Hamilton group, at Pratt's falls, Madison county, N.Y.

PLEUROTOMARIA EUOMPHALOIDES (n. s.).

SHELL depressed-orbicular. Volutions three or four, rising little above the plane of the outer volution, and increasing very gradually to the aperture, which is transversely broad elliptical.

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SURFACE concentrically striate, with a band upon the periphery.

The specimens examined are almost entirely casts ; some remains only of striae being preserved. The spire is less elevated than in the *P. sulcomarginata*, and the periphery and upper side of the last volution more rounded. It is possible that these casts may prove identical with the preceding species (*P. rotalia*) ; but no specimens with so great a diameter have been observed, and the spire is more depressed than in that species.

Geological formation and locality. In shales of the Hamilton group : at Hamilton, Madison county ; and at Fultonham, Schoharie county, N.Y.

CYCLONEMA HAMILTONIÆ (n. s.).

SHELL subconical : height a little more than the width across the last volution. Volutions four or five : apex minute and gradually expanding to the body-whorl, which is somewhat abruptly ventricose, flattened or a little concave for a short distance below the suture, and the space limited on the lower side by a carina or the first of a series of strong revolving striae.

SURFACE marked by fine lamellose lines of growth, which are directed backwards from the suture without bending or curvature. The volutions, except the narrow concave space above, are marked by strong revolving striae or elevated carinate lines, of which there are from fourteen to eighteen on the body-whorl.

This species has nearly the proportions of *Pleurotomaria lineata*, except in the more abrupt ventricosity of the body-volution. The concave belt on the upper side of the volution, which is without revolving striae and marked only by lines of growth, is a distinguishing feature ; and also the absence of elevated concentric striae and the band upon the periphery.

Geological formation and locality. In the shales of the Hamilton group : Cazenovia, N.Y.

CYCLONEMA LIRATA (n. s.).

SHELL robust, subdepressed-conical. Volutions about four, subangular, the last one becoming very ventricose : upper side of volutions flattened from the suture to the first carinate elevation.

SURFACE marked by fine closely arranged striae of growth, which are sometimes crowded in fasciculi giving gentle inequalities : these striae are directed a little backwards from the suture. The volutions are marked by moderately elevated carinate ridges, of which

two or three are visible on the upper volutions, and about five on the body-whorl; those on the upper side of the volution more distant than those on the lower side.

The larger specimens are about an inch in diameter, with a height about one-fourth greater.

Geological formation and locality. In the coarse sandy shales of the Hamilton group, in Chenango county, N.Y.

CYCLONEMA MULTILIRA (n.s.).

SHELL turbinate, ventricose. Volutions five or more : body-whorl very large and extremely ventricose.

SURFACE marked by fine concentric striae of growth, which are directed backwards from the suture towards the periphery, and pass to the lower side of the volution without deviation, except in the slight undulation at the crossing of the revolving lines. The surface of the volutions is marked by strong elevated revolving lines, of which there are about five or six upon the upper volutions, and ten or twelve on the body-whorl : the space from the suture to the upper of these lines is greater than between the lines, those of the periphery being more closely arranged than those above or below.

This species is similar in form to *C. lirata*, with the last volution more ventricose and all the volutions less angular ; and the revolving carinate lines are twice as numerous and not so strong. It is intermediate between the *C. hamiltoniae* and *C. lirata*; being a little more ventricose than either, without the flattened or concave band on the upper side of the volution.

Geological formation and locality. In the coarse shales of the Hamilton group at Smyrna, Chenango county, N.Y.

MACROCHEILUS HEBE (n.s.)

SHELL turreted, subfusiform; length less than twice the diameter.

Volutions nine, upper ones minute, the last two ventricose; one-half the height of each volution showing above the suture. Shell thick on all parts, and more extremely so near the aperture. Aperture longitudinally suboval, somewhat pointed below. Surface marked by extremely fine lines of growth. Height a little more than three-fourths of an inch.

This shell has all the characters of the Genus MACROCHEILUS as occurring in the Coal measures, and is the second well-marked species I have observed in the Hamilton group. This species resembles the *M. newberryi* of the Coal measures; but the two last volutions are more ventricose, the suture-line close, while the shell, of less length, has one more volution. From the *M. ventricosus* it differs in the larger and less attenuated spire, while the two last volutions are ventricose.

Geological formation and locality. In the Goniatite limestone of the Hamilton group at Manlius, N.Y. Collected by C. A. WHITE.

MACROCHEILUS HAMILTONÆ (n.s.).

SHELL very ventricose. Spire short, consisting of four or five volutions, the last one extremely ventricose, making nearly two-thirds the entire length of the shell. Aperture longitudinally oval, obtuse below. Shell distinctly striated by fine lines of growth. Suture-line deeply impressed. Length about one inch, with a diameter of nearly three-fourths of an inch.

This shell resembles in some measure the shorter and more ventricose forms of the Coal measures, the spire resembling that of *M. primigenius*.

Geological formation nad locality. In the coarse shales of the Hamilton group at Hamilton, Madison county, N.Y.

MACROCHEILUS (HOLOPEA) MACROSTOMUS (n.s.).

SHELL short, subglobose. Volutions about four or five, all above the last two minute, the last one extremely ventricose, so that the width from the columella is about two-thirds the height of the volution : greatest width of the shell equal to the height. Aperture rounded, a little extended on the lower side.

SURFACE marked by fine equal striae of growth, which are strongly directed backwards from the suture. Suture-line a little depressed below the plane of the convexity of the volution; the striae sometimes crowded in fascicles.

This species resembles in form some of the PLATYSTOMÆ; but the texture of the shell and surface-markings are not in accordance with the well-marked species of that genus. In surface-characters and form of shell it is similar to HOLOPEA; and having no positive knowledge of the aperture and columella, it is impossible to decide that it may not belong to that genus.

Geological formation and locality. In calcareous beds of the Hamilton group at Pratt's falls, Madison county, N.Y.

MURCHISONIA DESIDERATA (n. s.).

SHELL elongate, turritiform. Spire somewhat rapidly ascending : volutions ten or more, the five lower ones gradually enlarging, and the last one scarcely more ventricose than the preceding; flattened on the upper side, and a little more convex below the spiral band. Aperture somewhat elongate; the columellar lip thickened, and bounded by a well-marked callosity.

SURFACE marked by distinct concentric striæ, which are raised in fascicles above the general surface of the shell, and, bending gently back from the suture, reach the spiral band, which is flattened and limited by moderately elevated revolving lines. The spiral band is slightly below the centre of the volution, and marked by the retral curving striæ, which are less prominent on this and the adjacent parts than near the suture. Suture close.

The height of five volutions from the mouth upwards is nearly two and a quarter inches, and the diameter of the last volution is seven-eighths of an inch. The length of the aperture is about five-eighths of an inch, and the width half an inch.

This species occurs in the same rock with *M. maia* and *M. leda*, and differs conspicuously from either of them in the proportionally greater length of the volutions, and the distinct flattening upon the upper side. The suture-line in the present species is close, without indication of a groove, while the revolving striæ are less distinct than in those species.

Geological formation and locality. In Upper Helderberg or Corniferous limestone : Falls of Ohio ; and probably among numerous casts of similar forms in New-York.

MURCHISONIA TURRICULA (n. s.).

SHELL small, turritiform. Volutions about eight or nine, angular, rapidly increasing from the apex, the last one not more ventricose than the preceding, flattened above and a little convex below the spiral band. Spiral band strongly elevated, distinctly bounded by sharply carinated revolving lines, and below the centre of the upper volutions.

SURFACE marked by strong elevated concentric striæ above the band, which are less conspicuous below it. Suture-line sharply marked by the deep contraction of the shell : on the last volution, the suture-line is continued in a slender spiral line beyond the margin of the lip.

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This minute species has a length of about a quarter of an inch, and possesses in some degree the character of the species last described ; but the volutions are more angular and the suture-line more deeply impressed, while the concentric striae and the spiral band are proportionally much stronger. Six specimens have been examined.

Geological formation and locality. In the Hamilton group.

GENUS LOXONEMA (PHILLIPS).

In the Schoharie grit, and in the limestones above this rock, there are numerous casts, which, though evidently belonging to different species of *LOXONEMA* or *MURCHISONIA*, cannot readily be distinguished in the absence of surface-markings. Several species of these genera have already been described (14th Regents' Report, pp. 103, 104), from specimens retaining the surface-markings. There are other forms still, which, although we have no specimens with the shell preserved, nevertheless differ so widely from the others as to be distinguished by the form and proportions of the casts.

One of these from the Schoharie grit has the form and proportions of *L. attenuata* of the Upper Pentamerus limestone ; and in the casts, no means exist of pointing out characters which will distinguish the one from the other. Other specimens resemble the *L. compacta*; but a careful comparison shows the volutions to be a little more rotund, and the spire more rapidly ascending. The determination of species in this condition is attended with many difficulties, and in the end there must still remain some doubt when the differences of form and proportions may have been disguised by pressure or accident. Under these circumstances, I have ventured to characterize two or three species among the specimens which occur in the condition of casts.

LOXONEMA SOLIDA (n.s.).

SHELL turritiform, elongate. Spire gradually ascending : volutions moderately convex, the height of each one about half the diameter of the spire at the same point.

In a specimen of moderate size, five volutions from near the base measure one inch in vertical height.

This species is intermediate between *L. compacta* and *L. obtusa* in proportions of spire, and the volutions are slightly more convex. The specimens are all imperfect, without the shell, and are only to be distinguished by the form and proportions of the volutions.

Geological formation and locality. In Schoharie grit : Schoharie.

LOXONEMA? SUBATTENUATA (n. s.).

A cast of a species having proportions nearly similar to *Murchisonia maia* occurs in the Schoharie grit; but the shell has tapered somewhat more rapidly, the volutions are more ascending and less convex, and the form of the aperture is subovate and narrowed below. The length from base of aperture to top of the sixth volution is one inch and three-fourths, and the diameter of the last volution is about five-eighths of an inch.

In this species the volutions are less ascending, and the spire less attenuate than in *L. attenuata* of the Lower Helderberg group, which in many respects it resembles.

Geological formation and locality. In Schoharie grit : Schoharie.

LOXONEMA ROBUSTA (n. s.).

SHELL robust, terebreform. Spire rapidly ascending : length from the base of aperture to summit of fourth volution, three inches; above this there have probably been three or four volutions, adding to the length about three-fourths of an inch. Volutions moderately convex above the middle and flattened below, the last one slightly more ventricose : the diameter of this last is nearly an inch.

This is a larger and more elongate species than any other of the genus in the Upper Helderberg rocks. The specimen is a cast, having no surface-markings; but from the general character of the fossil, the flattened volutions and close suture-line, I am induced to refer it to the Genus LOXONEMA. A fragment of nearly the same proportions, and occurring in the same association, has a banded suture, and is clearly distinct.

Geological formation and locality. In Schoharie grit : Schoharie.

LOXONEMA DELPHICOLA (n. s.).

SHELL turritiform. Spire somewhat rapidly ascending : volutions eight or more, flattened upon the sides, the last one slightly ventricose. Aperture ovate, narrowed and attenuated below : columella thickened and extended below.

SURFACE marked by strong, not prominent, longitudinal striæ, which are bent slightly back for a short distance below the suture, and continue in a nearly direct line almost to the base of the volution, where they bend forward to the suture-line. Suture banded, or

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the upper edge of the volution overlapping the next preceding one, and constricted just beneath the margin, which is but faintly or not at all marked by the longitudinal striae

This species differs from the more common form of *LOXONEMA* of the Hamilton group in the lesser convexity of the volutions, straightness of striae (which, however, are more abruptly bent on the last volution), and the overlapping or banding of the upper margin of the volution at the suture-line. One specimen examined retains nearly six volutions, and has a length of one inch and a half; which would have been slightly increased, had the lower extension of the columella been entire : diameter of last volution half an inch. A specimen of the ordinary form, possessing six full volutions, measures one and a quarter inches in length ; the six volutions from the aperture reaching to the height of the fourth volution in the species under consideration.

Geological formation and locality. In shales of the Hamilton group : Delphi, Onondaga county, N.Y.

LOXONEMA HAMILTONÆ.

Loxonema nexilis : Geol. Report 4th District New-York, 1843, p. 201.

Not *Loxonema nexilis* of PHILLIPS.

SHELL elongate, subulate. Volutions convex, about thirteen in the largest specimens, very gradually increasing in size from the minute apex, the last one ventricose. Aperture ovate, narrowing below : columella extended.

SURFACE marked by longitudinal sharp curving striae, which bend backwards from the suture and forwards towards the base of the volution, having the greatest curve near the middle : striae separated by sharply defined grooves, which are a little wider than the ridges; the striae increasing in distance as the shell grows older.

A specimen showing thirteen volutions measures one inch and three-eighths in length, and the diameter of the last volution is half an inch.

This species is the common form in the Hamilton group, and differs from the preceding in the more numerous and more convex volutions, as well as in the more strongly arched striae and more extreme attenuation of the shell. I have heretofore identified this species with the *L. nexilis* of PHILLIPS ; but its form and proportions are intermediate between that and *L. sinuosa*, while the striae are curved as in the latter species. The figures of PHILLIPS represent the striae a little curved backwards at their upper extremities, with an enlargement just below ; features which our species does not possess [1861.]

Geological formation and locality. In shales of the Hamilton group : at Seneca and Cayuga lakes ; at Eighteen-mile creek, and more commonly in the shales east of Cayuga lake, at Delphi and other places.

GENUS EUOMPHALUS (SOWERBY).

EUOMPHALUS CLYMENTIOIDES (n. s.).

SHELL discoid. Spire depressed below the plane of the outer volutions : volutions about four or five, lying nearly in the same plane, slender and very gradually expanding, rounded above and below, the lower side the most convex, the section transversely ovate, narrower on the ventral or inner side of the volutions, the vertical and transverse diameters about as twelve to thirteen. Aperture transverse, subovate. Surface unknown. Diameter of shell, in the largest specimens seen, one inch and a half.

This species is known to me in the condition of casts only ; but its form and proportions furnish marked characters. The casts sometimes show impressions of transverse striae, which are at intervals apparently crowded in fascicles. The spire is more depressed than in *E. planodiscus* of the Goniatite limestone, while in that the section of the volutions is nearly circular.

Geological formation and locality. In the Schoharie grit : Schoharie.

EUOMPHALUS LAXUS (n. s.).

SHELL discoid. Volutions about four, nearly in the same plane, disjoined throughout their entire extent, very gradually and regularly expanding from the apex : section circular. Aperture (as far as known) subcircular, scarcely expanded.

SURFACE marked by crowded transverse striae, which are sometimes regular and equal, and, on some parts of the shell, more closely arranged, and all directed a little forwards from the inner side of the volution.

The greatest diameter of the largest specimen seen is one inch and five-eighths, and the diameter of the volution at the aperture is half an inch.

This species differs from any other in this series of strata, in the distinct separation of the volutions throughout their entire length. The impressions in stone are strongly marked by the transverse striae, and the casts preserve fainter impressions of the same markings.

Geological formation and locality. In the Corniferous limestone at Schoharie, and in the Hamilton group at Eighteen-mile creek and Alden in Erie county, and in the same formation in Otsego county, N.Y.

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EUOMPHALUS EBORACENSIS (n. s.).

SHELL discoid. Volutions subrotund, the section somewhat pentahedral, the upper side a little flattened, regularly curving on the inner side, narrowed and flattened on the lower side; the dorsal side presenting two narrow flattened faces with an obtuse angle between : towards the aperture, the inner side becomes straight and the lower side scarcely flattened.

SURFACE marked by closely arranged lamellose striæ, which are crowded and fasciculate, giving a somewhat rough exterior.

The entire form and character of this species are not determined ; the specimen examined being imperfect.

Geological formation and locality. In the shales of the Hamilton group at Eighteen-mile creek in Erie county, and at York in Livingston co. N.Y.

GENUS BELLEROPHON (MONTFORT).

BELLEROPHON CURVILINEATUS (CONRAD).

Bellerophon curvilineatus : CONRAD, Jour. Acad. Nat. Sciences, Philadelphia, 1842, Vol. viii, pa. 269, pl. 16, f. 7.

“ Discoid : volutions exposed; back sharply carinated; surface with “ oblique arched striæ.”

This species, cited by Mr. CONRAD as occurring in the Onondaga limestone, is more abundant in the Schoharie grit, though in this rock it rarely preserves the shell. The shell is discoidal ; the volutions four or five, compressed and sharply carinated on the back, each one embracing about half the width of the preceding one, the last one not more ventricose than the preceding, and bending almost rectangularly at the umbilical edge. Aperture triangular, acute at the anterior margin, which is deeply sinuate ; the curvature of the peristome from the umbilical side receding about one quarter of a volution to the dorsal line. The inner margins of all the volutions are exposed in the cavity of the umbilicus. Surface marked by fine striæ of growth, which are slightly fasciculate and follow the curvature of the aperture, making a retral curve of about one quarter of a volution. The dorsum is sharply carinate.

The casts of this species are angular on the back, showing a wide umbilicus.

This species has somewhat the form and proportions of the *B. dubia* of D'ORBIGNY ; but the umbilicus is proportionally larger, and the outer volution less rapidly widening towards the aperture.

Geological formation and locality. In the Onondaga limestone and Schoharie grit, at Schoharie and the Helderberg mountains.

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BELLEROPHON (BUCANIA) PELOPS (n.s.).

Casts of this species occur in the limestone of the Upper Helderberg group.

The shell has been very rotund : the volutions, which have been three or four, were exposed in the umbilicus; the transverse diameter of the volution is about twice as great as the length or dorso-ventral diameter, rounded on the back, and abruptly bent into the umbilicus ; the aperture expands laterally, and is somewhat reniform, with a sinus on the dorsal side ; the back is distinctly carinate on the last volution, and the surface has apparently been marked by transverse striae.

It is impossible to characterize the species fully from the materials possessed, but it may be distinguished by its similarity of form to *B. expansus*; but the dorsal carina on the cast of this one is more sharply marked, the volutions are less compressed in the dorso-ventral direction, and the umbilicus is more abruptly depressed.

Geological formation and locality. In the Schoharie grit at Schoharie, and in the limestones of the Upper Helderberg group at Clarence-hollow, N.Y.; and Brownville, Ohio.

BELLEROPHON ACUTILIRA (n.s.).

SHELL subglobose; the first volutions discoidal, and the body volution towards the aperture very ventricose; aperture expanded; peristome moderately sinuate in the middle in front; spire closely enrolled.

SURFACE marked by regular and subequidistant striae, which, bending forward from the ventral edge of the volution, make a broad curve on the side, and are abruptly bent backwards, making a sharp (^-shaped) angle on the dorsal line, which is acute on the upper part of the last volution, but becoming regularly convex, with a less abrupt curvature of the striae upon the more expanded part towards the aperture.

In one specimen of this shell, I find characters corresponding to those given by Mr. CONRAD to *B. brevilineatus*. The striae proceeding from the umbilicus are well marked at first, but become obsolete on the side of the volution, but are well marked again on the dorsum. This character obtains only on the last half of the outer volution, and above this the striae are uniform over the whole surface : the periphery is obtusely angular, but not acute ; and it does not appear, therefore, that this can be identical with the species of CONRAD. At certain periods in the growth of the shell, the sinuosity in the anterior side of the peristome has been very deep and acute ; but at a later period, the character has become gradually less extreme.

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Geological formation and locality. In the shales of the Hamilton group at Hamilton in Madison county, N.Y.

BELLEROPHON PATULUS.

Bellerophon patulus : HALL, Geol. Report 4th District New-York, 1843, p. 196, f. 1.
SHELL subglobose, ventricose : umbilicus small; volutions rounded, the last one near the aperture abruptly and widely dilated, overlapping the volution on the posterior side. The upper part of the last volution is marked on the back, and partially upon the sides, by strong, even, arching striae, which are more abruptly bent on the dorsal line. These striae become obsolete on the middle and lower sides of the volution and upon the broad expansion towards the aperture, which is marked only by fine striae of growth ; and these are sometimes a little more crowded, giving an undulating surface. Anterior margin of the peristome with a broad shallow sinuosity at the upper side of the last volution : some revolving striae are observed crossing the others.

Nearly all the specimens examined are more strongly striate on the back of the volution above the expansion, than the one figured in the Geological Report of the Fourth District, but in other respects there is no important difference.

The aperture in the transverse diameter measures a little more than one inch and five-eighths, and in the longitudinal direction one inch and a quarter. Another specimen has a diameter of aperture of nearly two inches.

Geological formation and locality. In the coarse shales of the Hamilton group in Schoharie county, at Hamilton in Madison county, at New-Berlin and other places ; and also in the soft calcareous shales of the shore of Lake Erie at Eighteen-mile creek.

BELLEROPHON RUDIS (n. s.).

SHELL extremely ventricose; the first volutions rounded and subglobose, with a small umbilicus. The last half of the body-volution is abruptly expanded, and the peristome spreading almost rectangularly to the axis of the shell. Anterior margin of the peristome slightly sinuous, and spreading on the posterior side over the preceding volution. The upper part of the last volution is

marked by strong transverse arching ridges which are closely arranged, but, approaching the aperture, they become irregular, and more distant from each other : the expanded portion has two or three strong folds or wrinkles parallel to the margin of the peristome, which are stronger in front and become obsolete on each side of the expansion. The sides of the last volution are marked by longitudinal ridges which reach nearly to the margin in front, but in some parts are irregular and obscure.

This shell resembles in form the *B. patulus*, but is more robust, the transverse striae stronger, and the concentric folds on the expanded portion of the shell, as well as the longitudinal ridges on the sides, are characters not possessed by that species. The transverse diameter is about one inch and three-fourths, and the longitudinal diameter one inch and a half.

The *B. patulus* and *B. rufus*, in the broad posterior expansion of the peristome, which is not joined to the volution, resemble the PHRAGMOSTOMÆ, to which genus they may belong. The large size and rotundity of the volution beyond the aperture, in the absence of positive knowledge of the interior, has induced me to place them under BELLEROPHON.

Geological formation and locality. In the coarse shales of the Hamilton group at Fultonham, Schoharie county, N.Y.

BELLEROPHON LEDA (n. s.).

SHELL subglobose, a little flattened upon the dorsum. Body-whorl ventricose : aperture very wide; peristome abruptly spreading and broadly sinuate in front, with sometimes a deeper notch in the middle.

SURFACE marked by strong longitudinal or revolving striae, which alternate in size, and are often finer and more numerous on each side of the dorsal band. The revolving striae are cancellated by finer transverse striae. On the dorsum there is a narrow band which is not elevated, or sometimes scarcely raised above the surface, marked by two or three revolving striae, and upon which the transverse striae make an abrupt retral curve. In the exfoliation of the shell, and even in the best preserved specimens, the elevated transverse striae sometimes become obsolete towards the aperture; and the revolving striae, becoming obsolete also, leave a border marked only by the striae of growth.

The usual length of the shell, as seen in the calcareous shale, is about half an inch, with a width of about five-eighths of an inch;

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and a large well-preserved specimen, with expanded aperture, measures seven-eighths of an inch from the back of the dorsum to the front of the aperture, and the aperture has a transverse diameter of one inch and a half.

This species resembles in form and surface-markings the *B. decussatus* of FLEMING = *B. elegans* and *B. clathratus* of D'ORBIGNY, and *B. cancellatus* of HALL.

This species is well marked, and readily distinguished from any other in the formation, except the following species (*B. lyra*), which bears some resemblance, but is more evenly expanded and with different surface markings. The broadly expanded aperture, with nearly smooth borders, is rarely seen in ordinary specimens. In specimens of this character, however, the dorsal band is sometimes much elevated near the front.

Geological formation and locality. In the Hamilton group : Lake Erie shore at Hamburgh, N.Y.

BELLEROPHON LYRA (n. s.).

SHELL subglobose; the last half of the body-volution very ventricose and abruptly spreading towards the aperture, which is extremely expanded and round-oval in form, a little wider than long. Peristome distinctly sinuate in front.

SURFACE marked by regular even revolving striae, which are wider than the spaces between them; or the larger ones appearing to be composed of two or three smaller ones, with a narrow scarcely impressed line between. These striae are slightly undulating and very distinct, to near the aperture, where they terminate in a narrow smooth border, which is not thickened exteriorly. There are no distinct transverse striae, though faint lines of growth are visible under a lens. The dorsum is marked by an elevated carina, which is crossed by distinct elevated arching and subimbricating or lamelliform striae or ridges, at the distance of about two or three in the space of a line.

This species bears some resemblance to *B. leda*; but the aperture is more equally and less abruptly expanded, and there are no conspicuous transverse striae, while the revolving striae are broader, and the dorsal band elevated into an obtuse carina with distant imbricating striae. Length of aperture about seven-eighths of an inch, with a transverse diameter of an inch.

Geological formation and locality. In the coarser shales of the Hamilton group at Fultonham, Schoharie county, N.Y.

BELLEROPHON OTSEGO (n. s.).

SHELL subglobose. Body-volution ventricose, somewhat trilobate, the middle much wider than the lateral lobes, gradually spreading towards the aperture, which is moderately expanded and somewhat deeply sinuate in front.

SURFACE marked by regular transverse arching striæ, which have a retral curve upon the dorsum. Dorsum marked by a narrow band, enclosed between two sharp elevated striæ, which are distant from half a line to a line, varying with the size of the shell.

The lateral lobes are separated from the central or main part of the volution : this character, with the comparatively wide dorsal band limited by thin sharp striæ, are characteristic features.

Geological formation and locality. In the coarse sandy shale of the Hamilton group in the south part of Schoharie county, and in Otsego county.

BELLEROPHON THALIA (n. s.).

SHELL ovoid or subspheroidal. Volutions rotund, the last one gradually expanding and becoming ventricose towards the aperture, which is somewhat orbicular, with a deep sinus at the anterior margin : umbilicus closed.

SURFACE with fine even concentric striæ. Dorsum, in the east, marked by a sulcate carina.

This species occurs as casts of the interior, and retaining portions of the shell showing a surface-marking similar to *B. bilobatus* of the Lower Silurian rocks ; and the shell has nearly the same form and proportions, with the exception of the carinate dorsum.

Geological formation and locality. In the shales of the Hamilton group at York in Livingston county, and at Pratt's falls in Madison county, N.Y.

GENUS PHRAGMOSTOMA (HALL).

PHRAGMOSTOMA NATATOR.

Bellerophon expansus? Geol. Rep. 4th District New-York, 1843, p. 244, f. 3; p. 243.
Not *Bellerophon expansus* of SOWERBY.

This species shows a widely expanded aperture, with a deep sinuosity in the anterior margin : the sides of the shell are strongly undulated or wrinkled. The dorsum is marked by an obtuse angular

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carina, upon which the striae are acutely bent backwards and make a broad curve upon the sides of the volution. The spire is small, and closely incurved.

The accidental breaking of the apex of a specimen of this species, from the upper part of the Hamilton group, disclosed an extension of the lip on the ventral side into the cavity of the shell, forming a septum as in the typical forms of *PHRAGMOSTOMA*.

The shell preserves no evidence of revolving striae, and the specimen from the Hamilton group presents characters similar to those represented in the figure cited.

I had originally referred this with doubt to *Bellerophon expansus* of SOWERBY, but later observations show it to be distinct. It is not improbable that the species of SOWERBY may prove to be a *PHRAGMOSTOMA*, and not a true *BELLEROPHON*.

Geological formation and locality. In the coarser shales of the Hamilton group in Chenango county, and in the shale of the Portage group at Cashaqua creek, Genesee county, N.Y.

GENUS CYRTOLITES (CONRAD).

CYRTOLITES? MITELLA (n.s.).

SHELL arcuate, subovoid, making altogether about two volutions in the same plane; the first volution very minute; the body-whorl rapidly expanding to the aperture, which is nearly circular with the peristome scarcely spreading, obtusely but distinctly angular on the dorsum; apparently not sinuate, or but slightly sinuate on the peristome.

SURFACE marked by regular sharply elevated transverse striae, which, when partially exfoliated, give a lamellose striate surface : these striae are scarcely bent in passing over the angular dorsum, and do not appear to be cancellated.

Geological formation and locality. In the shales of the Hamilton group at Cazenovia, Madison county, N.Y.

CYRTOLITES PILEOLUS (n.s.).

SHELL obliquely or arcuately subconical. Apex of the spire making a single slender volution and rapidly spreading below, distinctly angular on the back. Aperture nearly round, a little angular in front : peristome expanded, without apparent sinus.

SURFACE marked by distinct undulated revolving striæ, which become less conspicuous towards the aperture : obscure lamellose striæ of growth mark the surface transversely.

In this species the sides of the volution are less convex, and the dorsum more distinctly angular (or subcarinate) than in the preceding species. The equal undulating revolving striæ constitute a conspicuous difference between the two. In the casts, faint impressions of the revolving striæ are preserved.

Geological formation and locality. In the coarse shales of the Hamilton group at Hamilton and at Pratt's falls in Madison county, N.Y.

GENUS THECA (SOWERBY).

THECA LIGEA (n.s.).

SHELL elongate, triangular, compressed, very gradually tapering to an acute extremity. Length about twice the width, and the diameter from side to side equal to half the width. Margins thin and sharp; one side flattened or slightly convex, with a depressed line on each side a little within and parallel to the margin : opposite side convex, angular in the middle. Section triangular; the peristome on the flattened side produced beyond the opposite, curved and apparently thickened at the margin.

SURFACE marked by transverse lines of growth, which have been arched upon the angular side.

The specimen is a cast in limestone, preserving faint indications of the transverse striæ.

Geological formation and locality. In the Upper Helderberg limestone at Clarence-hollow, Erie county, N.Y.

GENUS CONULARIA (MILLER).

CONULARIA UNDULATA.

Conularia undulata : CONRAD, Ann. Rep. Palæontology of New-York, 1841, p. 57.

“ Distinguished from *C. quadrisulcata* by having the striæ more “ crowded and undulated, and by the absence of lines crossing “ the furrow between the striæ.”

This fossil is not rare in some localities of the Hamilton group. The longitudinal striæ crossing the furrows are obsolete, or nearly so, on the upper and middle portion of the shell, and sometimes faintly perceptible near the base.

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This is a large species, frequently reaching the length of six inches. I am indebted to LEDYARD LINCKLAEN, esquire, of Cazenovia, for a specimen five and a half inches inches in length, the upper end of which is truncated by an arching septum; and at this point, each face has a width of more than half an inch. Had the shell been extended to an acute point in a line continuous with the sides, it would have been more than seven inches in length.

The occurrence of a septum in the upper part of the cavity of *CONULARIA* has been observed in specimens of at least three species from three different geological positions, and must be regarded either as a normal character of the shell, or that the apex may have been deciduous as the animal receded from that part of the shell, and this arrangement was adapted for its protection.

Geological formation and locality. In the coarse shales of the Hamilton group at Cazenovia, Hamilton and Schoharie, and in the Marcellus shale near Bridgewater, Oneida county, N.Y.

CEPHALOPODA.

GENUS CLYMENIA (MUNSTER).

CLYMENIA COMPLANATA.

Clymenia complanata : HALL, Geol. Report of the Fourth District New-York, 1843, p. 244, f. 5; p. 243.

SHELL discoid, flattened. Volutions four or five, slightly embracing, gradually enlarging towards the aperture.

SURFACE marked by fine regular striae, which are directed a little forward from the ventral side of the volution, and, when near the dorso-lateral margin, bend backward into a shallow revolving groove, from which they make a very abrupt retral curve to the dorso-lateral angle. Some remains of undulating septa are visible in two specimens.

This species, described from a compressed specimen in the green shale of the Portage group at the mouth of Cashaqua creek, has been found in other places. The characters are pretty uniform as far as can be ascertained from the specimens, all of which are much compressed, so that the original form cannot be fully determined. Greatest diameter one inch and three-fourths; and the width of the outer volution, when extremely compressed, is nearly three-fourths of an inch.

Geological formation and locality. In the green shales of Cashaqua creek in the lower part of the Portage group, and in the upper part of the Hamilton group at Eighteen-mile creek, Lake Erie.
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CLYMENIA ERATO (n. s.).

SHELL discoid. Volutions about three, besides the nucleus : centre depressed below the plane of the outer volution, which is moderately convex on the side, and embraces about one-third the width of the penultimate volution. Outer volution obtusely angular on the dorso-lateral margins, with a distinct revolving groove on the side about one-third the width from the dorsal margin. This groove, upon the inner volution, is visible within the suture line.

SURFACE marked by fine equal striæ, which are directed a little backwards from the ventral side of the volution, are fainter on the middle of the side, and, turning a little into the groove, are abruptly bent forward beyond it, and, upon the middle of the dorsal lobe, make a very sharp curve, turning backwards and reaching the dorso-lateral angle, which is slightly truncate (and, in crushed specimens, is marked by a shallow groove). The back is somewhat flattened : septa undetermined.

This species, in the largest specimens seen, is nearly two inches in diameter ; and the outer volution, when flattened, is five-eighths of an inch from the ventral to the dorsal side. It differs from *C. complanata*, in having a lesser number and more robust volutions, the penultimate one of which is more embraced within the outer one ; in the form of aperture, and conspicuously in the direction of the surface striæ.

Geological formation and locality. In a compact calcareous band at the top of the Hamilton group at Fall brook, Genesee, and at Paterson's creek, Moscow, N.Y.

GENUS TROCHOCERAS* (BARRANDE, HALL).

TROCHOCERAS DISCOIDEUM (n. s.).

SHELL subdiscoid, making three or four volutions, broadly umbilicate on the lower side. Volutions contiguous, slender, gradually enlarging from the apex : peristome somewhat abruptly expanded;

* The Genus *TROCHOCERAS* was proposed almost simultaneously by M. BARRANDE and myself for fossil species generically similar, and without any concert of action, or of either being aware of the conclusions of the other. The name proposed by me was printed in the second volume of the Palæontology of New-York in 1850, although the volume was not issued till 1852; and it was only after this that I became aware that M. BARRANDE had published a Genus *TROCHOCERAS*.

aperture round. Septa distant about one-third the diameter of the tube. Shell thin or free from nodes or ridges, except towards the aperture, which appears to be thickened. Greatest diameter of the shell across the volutions, about two inches : diameter of the outer volution three-fourths of an inch.

SURFACE markings undetermined.

This species is more slender in its volutions than the *T. clio*, with a much wider umbilicus and a less elevated spire. Although I have seen but a single specimen, the form and proportions clearly indicate it to be a very distinct species.

Geological formation and locality. In the Schoharie grit : Schoharie.

GENUS GYROCERAS (MEYER).

GYROCERAS TRIVOLVIS (CONRAD, sp.).

Cyrtoceras trivolvis : CONRAD, Ann. Rep. Palæontology of New-York, 1840, p. 206.
“SHELL large, rounded, with transverse lines of growth : septa
“numerous.”

This species is the most common one known in the Upper Helderberg limestones. So far as I know, however, it rarely or never reaches three volutions.

The tube is rounded ; volutions disjoined, gradually enlarging to the aperture, which is not conspicuously expanded beyond the proportions of other parts of the shell ; section of the volutions nearly circular, or round-oval : septa distant about one-sixth of the diameter. A fragment three inches long, measured along the centre of a longitudinal section, embraces sixteen chambers, and has a diameter in the middle of one inch and a quarter : the convexity of the septa, from the ventral to the dorsal side, is a little more than twice the space between the septa. Siphuncle subcentral, being a little excentric on the dorsal side. The shell is marked by close lamellose transverse striae, and is raised in transverse ridges which are distant sometimes the space of one and sometimes of two septa, and usually directly over this part of the shell : these ridges have a slight retral bend on the back of the shell, giving a similar sinuosity to the aperture.

In many specimens the shell is not distinctly or decidedly annulate, but presents transverse undulations which are less conspicuous on the ventral side.

The *C. tricolvis* is the most common species in the Upper Helderberg limestones, and frequently measures six inches across the volutions.

Geological formation and locality. In limestone of the Upper Helderberg group in the Helderberg mountains, Schoharie, Oneida and Onondaga counties.

GYROCERAS MATHERI (CONRAD, sp.).

Cyrtoceras matheri : Ann. Report on the Palæontology of New-York, 1840, p. 206.

"Resembles the last, but the transverse ridges are more prominent
"and distant : they meet at an angle on the middle of the back."

This shell makes from one to one and a half volutions. Shell somewhat rapidly enlarging from the apex. Section nearly circular towards the apex, and becoming transversely elliptical towards the aperture, so that the two diameters are about as nine to twelve. Septa distant : where the dorso-ventral diameter of the shell is one inch, the distance of the septa on the side of the shell is nearly half an inch ; on the ventral side, three-eighths of an inch ; and on the dorsal side, five-eighths of an inch.

Surface marked by close lamellose striae, which are abruptly arched backwards upon the dorsum, and the shell raised in strong ridges corresponding to the septa, which are abruptly bent backwards on the dorsal line. The casts show elevations along the line of the septa, corresponding to the exterior ridges, and the surface between is distinctly depressed. Faint revolving bands mark the surface of the casts, and each band is composed of several slender striae. Specimens of the ordinary size measure from four to five inches across the greatest diameter.

This species differs conspicuously from *C. trivolvus* in the less circular form, more rapid enlargement, strong transverse ridges, and more distant septa.

Geological formation and locality. In the Upper Helderberg limestones at Schoharie and near Catskill.

GYROCERAS UNDULATUM (VANUXEM, sp.).

Cyrtoceras undulatus : VANUXEM, Geological Report Third District New-York, 1843,
pp. 139 & 140, f. 2.

SHELL consisting of two or three free volutions, which are gradually expanded towards the aperture. Volutions scarcely symmetrical ; section somewhat obliquely oval as in *TROCHOCERAS*, though the volutions are apparently in the same plane : transverse diameter of the volution greater than the dorso-ventral diameter. The septa are distant about one-fourth the ventral diameter.

SURFACE strongly striate or lamellose, the lamellæ arching backwards : on the dorsal line, and on the dorso-lateral angles, the lamellæ are sharply bent backwards at every fourth volution, forming two rows of lamellose nodes or short spine-like processes. The greatest diameter across the volution is about five and a half inches.

This species differs conspicuously from either of the preceding in the form of the volutions, and particularly in the arching node-like processes on the dorso-lateral angles.

Geological formation and locality. In the Upper Helderberg limestone: Oneida and Schoharie counties, and in the Helderberg mountains.

GYROCERAS NEREUS (n. s.).

SHELL subdiscoid, making a little more than one volution. Volutions rotund, somewhat rapidly increasing in size : section nearly circular; septa, in the middle of the last volution, distant about one-fifth of an inch.

SURFACE marked by fine undulating striæ of growth, and, at unequal distances of a little less than a line, the shell is produced in sharply undulating lamellæ, which are produced at right angles to the axis of the shell.

In this external character, the shell differs from the other species in this formation. In a specimen of medium size, there are eight of these lamelliform ridges in the space of an inch ; and in another larger individual there are seven in the same distance, while towards the apex there are twelve. The greatest extent across the volutions is six inches. The best specimen is flattened, so that the proportions cannot be fully determined.

Geological formation and locality. In the Corniferous limestone : at Auburn, N.Y.

GYROCERAS ERYX (n. s.).

SHELL large, making one or two volutions. Volutions very rotund, gradually expanded to the outer cavity, which appears to be proportionally a little wider and very deep.

The specimens which I have seen are all imperfect, but could not have made less than one and a half volutions. One specimen consists of a part of the septate portion of a small or medium-sized individual, and, making nearly two-thirds of a volution, measures about four and a half inches across the disc : at the larger end, the dorso-ventral diameter is an inch and a half ; and at the smaller end, nearly an inch. At the smaller end of this specimen there are eight chambers in the space of an inch ; and at the larger end, nearly five in the same distance measured upon the side of the volution. A larger specimen, which appears to be nearly complete at the aperture and makes the greater part of one volution, measures eight inches from the outer sides across the disc : this diameter may have been a little increased 1861.]

by compression. The dorso-ventral diameter of the mouth is three inches ; which, allowing for pressure, may have been originally two and a half inches. After making two-thirds of a volution, the diameter is about one inch and three-fourths.

There have apparently been no strong surface - markings : impressions of the exterior show striae of growth, which are crowded and somewhat wrinkled on the inner margins of the curve.

Geological formation and locality. In limestone of the age of the Upper Helderberg group : near Milwaukee, Wisconsin.

GYROCERAS CYCLOPS (n. s.).

SHELL large, gradually tapering from the aperture : one or more volutions; section circular; siphuncle dorsal.

SURFACE lamellose striate, and at intervals projected in strong foliate expansions, which are plicated towards their periphery.

In a specimen making nearly one volution, and measuring on the dorsal curve sixteen inches, the dorso-ventral diameter is about three inches at the mouth, and about one inch at the other extremity. The greatest diameter, from the exterior sides of the curve, is about eight inches.

A far as can be ascertained, the siphuncle is dorsal. The septa are obscure, and have not been clearly observed within less than an inch of each other. Below the last chamber there are two septa, or a thickened septum, making a thickness of an eighth of an inch ; and at an interval of a little more than an inch, another similar feature, and a third at an inch below the second. The strong lamellose extensions are about an inch asunder where the diameter of the shell is two inches, and these make a retral curve upon the back of the shell.

In a fragment of this species given to me by Prof. ANDREWS of Marietta, Ohio, the foliate expansions extend an inch beyond the plane of the surface of the shell, are strongly plicated upon the distal half of their width, and closely marked by concentric lamellose striae. The larger specimen described is from the Cabinet of the Albany Institute.

Geological formation and locality. In limestone of the Upper Helderberg group : Helderberg mountains ; and near Columbus, Ohio.

GYROCERAS NAIS (n. s.).

SHELL consisting of two or more volutions, which are somewhat rapidly expanded from the apex towards the aperture. Volutions subangular in the middle of the sides, rounded on the back, with

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the dorsum a little elevated and sloping abruptly on the umbilical side.

The umbilical slopes of the volution are marked by strong rounded transverse striae, which are sometimes bifurcated towards the side of the shell, and are crossed by a few revolving depressed lines. The back of the shell is conspicuously marked by flattened revolving bands, which are crossed by less conspicuous transverse striae. The dorsum is marked by a narrow depressed band, on which the striae make an abrupt retral bend, indicating the sinuosity in the margin of the aperture. About halfway from the dorsal line to the angular sides of the volution, commence low elevations, which become strong oblique ridges or elongate nodes; which are limited by the angular margin of the volutions, and do not pass to the ventral region.

The specimen examined preserves about one and a half volutions, is imperfect towards the aperture, and the apex is broken off : it has had a diameter of about two inches.

This is a strongly marked species, and readily distinguished from any other known to me in the upper members of the New-York series.

Geological formation and locality. In the shales of the Chemung group. Chemung county, N.Y.

GYROCERAS (CYRTOCERAS?) SPINOSUM.

Phragmoceras spinosum : CONRAD, Ann. Rep. Palæontology New-York, 1840, p. 206.

"SHELL with two rows of foliated spines."

This species is cited by Mr. CONRAD from the Schoharie grit. A fossil which I suppose to have been the one described by Mr. CONRAD, has the form and aspect of a CYRTOCERAS with the smaller extremity broken off ; and though I have not seen an entire specimen, or one making a full volution, yet I have little doubt, from the curvature and the proportions of the parts, that it has more than one volution. The shell gradually enlarges towards the aperture, which is not expanded beyond the general proportions of the shell below. The section is broadly elliptical ; the greatest diameter, in the dorso-ventral direction. Measured on the side of the shell, there are about six chambers in the length of the greatest diameter. Siphuncle sub-central. Surface with strong lamellose transverse striae, which, on the ventral side and perhaps on other parts, are raised in undulating low bands or ridges. There are two rows of lamellose nodes or "foliated spines" on each side, formed by the extension of the shell in short retral arches.

Geological formation and locality. In Schoharie grit : Schoharie and the Helderberg mountains ; and in the same rock in Ulster county, N.Y. 1861.]

GENUS CYRTOCERAS (GOLDFUSS).

CYRTOCERAS EUGENIUM (n. s.).

SHELL elongate : the first five or six inches from the aperture make a curve of not more than half an inch. A specimen of medium size measures along the outside of the curve a little more than seven inches, and it may have been an inch longer when entire. The transverse diameter is greater than the dorso-ventral diameter; being as six to five at the smaller end, and in the same proportion at an inch below the aperture, namely, one inch and a half to one inch and a quarter. At the smaller extremity, the divergence from a straight line along the body of the shell is less than three inches, and the diameter indicates a curvature of not more than a quarter of a circle.

A larger specimen, where the straight portion of the shell has a length of six inches, and the smaller extremity (where broken off) has a diameter of an inch; the dorso-ventral diameter, at the aperture, is one inch and a quarter, and the transverse diameter is a little more than one inch and five-eighths : it has the same diameter at a point two inches beyond the aperture, while the intermediate space is slightly enlarged. On the outside of the curve, the septa are distant very nearly one-fourth the dorso-ventral diameter. The siphuncle is upon the outer side of the curve, and close to the shell.

The surface is marked by transverse elevated or sublamellose lines of growth; and at intervals corresponding to the septa, are strong lamellose ridges, the effects of which are shown upon the cast in distinct concentric ridges which are bent abruptly downwards on the back of the shell : these ridges become less prominent on approaching the aperture; but the bending of the striae continues the same, and the margin of the aperture shows a sinuosity of a quarter of an inch in depth by nearly half an inch in width.

This is a remarkable and well-marked species, and may be known even in fragments by the form and proportional distance of the arched transverse ridges, which resemble those of *Gyroceras matheri*, but are twice as numerous in equal space.

Geological formation and locality. In the Schoharie grit at Sehoharie, and in the Helderberg mountains.

CYRTOCERAS JASON (n.s.).

SHELL large and strong : outer chamber very deep, uniformly expanding towards the aperture; section somewhat obtusely hexagonal, the septate portion round.

A fragment of the outer chamber, which shows no evidence of septa throughout its entire extent, measures nine inches in length and about three inches in the dorso-ventral diameter; the middle of the side, for a width of nearly an inch and a half, is flattened or depressed convex, and limited by very obtuse or rounded angles : another similar flattened space occupies the ventral slope, and a narrower one the dorsal slope; the ventrum is likewise flattened. The surface is strongly lamellose-striate, and, at irregular intervals, is projected from the sides in lamelliform rings which are deeply sinuate and thickened upon the obtuse angles : there is apparently a row of these upon the dorsum; but this cannot be satisfactorily determined, in consequence of adhering stone. In a length of six inches, there are thirteen of these lamellose extensions.

A fragment of the septate portion of a specimen, measuring seven inches in length, is two inches in diameter, and has three chambers in the space of an inch. The outer chamber, of nine inches in length, has a deviation from a straight line of one inch; and the septate fragment of seven inches has a deviation of about three inches.

In surface-characters, this species bears some resemblance to *Gyroceras (Cyrtoceras) spinosum*; but in that one the striæ between the rows of spiniform processes are more undulatory, and, on the ventral side, are regularly undulating, the retral curve being depressed so that the surface is marked by low revolving bands. In a specimen of that species seven inches long, and preserving part of the outer chamber, the curve or deviation from a right line parallel with the outer chamber is five inches and a half.

Geological formation and locality. In the Schoharie grit : Schoharie.

CYRTOCERAS MORSUM (n.s.).

A small species in the limestone, with a length of a little more than two inches, has a diameter of a quarter of an inch at the smaller imperfect extremity, and a little over half an inch at the larger extremity : section circular. Surface marked by fine transverse striæ, which are aggregated in gently swelling ridges apparently corresponding to the septa.

The specimen is too imperfect to be fully characterized.

Geological formation and locality. In limestone of the Upper Helderberg group at Clarence-hollow, Erie county, N.Y.

CYRTOCERAS METULA (n.s.).

This species is very gradually curving ; the specimen examined making, in a length of two inches, less than one-eighth of one volution. The smaller extremity of the fragment has a diameter of three-eighths of an inch; and the larger extremity, which is at the commencement of the outer chamber, has a dorso-ventral diameter of three-fourths of an inch, while the transverse diameter is nearly an inch. The septa are numerous, and about a line distant from each other on the middle of the specimen.

This specimen contrasts strongly with the preceding in its proportions, and may be readily distinguished by its much more rapid expansion towards the aperture.

Geological formation and locality. In limestone of the Upper Helderberg group at Clarence-hollow, associated with the preceding species.

GENUS APLOCERAS (D'ORBIGNY).

APLOCERAS (CYRTOCERAS) LIRATUM (n.s.).

A fragment, clearly appertaining to this genus of D'ORBIGNY, has been found in the Goniatite limestone. The specimen preserves three or four of the septa and a part of the outer chamber : the section is circular; the septa are distant a little more than an eighth of an inch. The surface is longitudinally fluted by regular ridges, as in the typical species of the genus.

Geological formation and locality. In the Goniatite limestone at Manlius, Onondaga county, N.Y.

GENUS GOMPHOCERAS (SOWERBY).

GOMPHOCERAS BETA (n.s.).

A small species, attaining the length of about an inch and a half.

The form is ovoid; the seven or eight chambers before the last measuring about three-fourths of an inch, and the outer chamber as much more. The greatest diameter, when not compressed, is nearly half as great as the length. The septa are thick, and the siphuncle marginal.

Geological formation and locality. In the Schoharie grit at Schoharie. [September,

GENUS ORTHOCERAS (BREYN).

ORTHOCECAS PELOPS (n. s.).

SHELL robust, somewhat rapidly tapering : section circular ; siphuncle central.

This species is known to me only in the condition of casts of the interior. Specimens are rarely found with a length of two feet, but always imperfect. The outer chamber is very long and large. A fragment of the septate portion seven inches long, the proportions of which are pretty well preserved, has a diameter of two inches at the larger and one inch at the smaller extremity. In a specimen 1·75 diameter at the larger end, three chambers measure 1·57 inches; and in a specimen four inches long, with a diameter of one inch at the smaller extremity, there are thirteen chambers. In a fragment where the smaller extremity is less than half an inch, there are twenty septa in a length of three and a quarter inches.

There are some variations in the proportions between the parts, and the number of septa in the same space, with an equal diameter. The siphuncle is small; being scarcely more than three-twentieths of an inch in diameter, and not more than half this diameter in some of the smaller specimens.

This is the common and abundant species of the Schoharie grit; but it is extremely difficult to find any but fragmentary specimens.

Geological formation and locality. In the Schoharie grit at the Helderberg mountains and Schoharie.

ORTHOCECAS TETRICUM (n. s.).

In the more calcareous beds of the Schoharie grit, there is a species of ORTHOCERAS of a more gradually tapering form. The siphuncle is comparatively large and a little eccentric : the septa, where the diameter of the shell is an inch and a half, are half an inch distant, or nine in the length of five inches and a half where the diameter at the smaller end is one inch. The distance of the septa is about double those of the preceding species, while it differs from the *O. longicameratum* of the Lower Helderberg group in the lesser comparative distance of the septa.

Geological formation and locality. In the calcareous part of the Schoharie grit : in the Helderberg mountains.

ORTHOCEAS FOLIATUM (n. s.).

SHELL elongate, very gradually tapering : septa comparatively distant ; siphuncle unknown.

SURFACE marked by fine concentric striæ, and, at intervals corresponding with the septa, the shell extends in lamelliform expansions at nearly right angles to the axis, or inclined a little towards the aperture : these lamelliform expansions are gently curved downwards on the back of the shell, and abruptly bent on the dorsal line, leaving a sinuosity in the margin of the aperture.

A specimen, of which the shell only is preserved in the stone, measures more than seven and a half inches; and in this space are twenty-two projecting ridges, some of which extend more than a quarter of an inch beyond the body of the shell : in the middle there are about three of these ridges, or a little less, in the space of an inch; but at the larger extremity, or towards the aperture, they are more crowded, giving five in the space of an inch. In another specimen, three spaces occupy an inch and a quarter; and in a cast of the interior, they present about the same proportions.

This species is not uncommon in fragments or impressions of the exterior ; and the similarity of these impressions to those of *Cyrtoceras eugenium* suggests a relation between the two, but in this one the strong annulations continue almost to the aperture, while in that species they do not. If this be a CYRTOCERAS, it bears nevertheless an undeviating straight line for at least eight inches.

Geological formation and locality. In the Schoharie grit : Helderberg mountains, and Schoharie.

ORTHOCEAS BACULUM (n. s.).

SHELL cylindrical, scarcely tapering : outer chamber very long ; septa somewhat deeply concave, distant more than one-third the diameter of the shell. Siphuncle excentric. Surface unknown.

This species is remarkable for its slender cylindrical form. A specimen five and a half inches long, and preserving more than three inches of the outer chamber, is scarcely appreciably diminished towards the apex, the greatest actual diameter being in the middle of the length. Another fragment of nearly four inches in length, of which an inch and a half pertains to the outer chamber, shows scarcely a diminution in the diameter. The first of these specimens has a diameter of five-eighths of an inch, and the second, of half

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an inch. A still larger fragment has a diameter of seven-eighths of an inch.

This species is readily distinguished from any other known to me in the whole series, by its slender and almost cylindrical form.

Geological formation and locality. In the Schoharie grit at Schoharie.

ORTHOCEAS THOAS (n. s.).

SHELL cylindrical, very gradually tapering towards the apex : outer chamber deep; septa very concave, the concavity exceeding the distance between them. Siphuncle small, central.

SURFACE annulated by strong direct ridges just above (or on the apicial side) of each septum ; longitudinally striated by coarse rounded striæ, which are distant from each other nearly twice their width : these striæ are usually rigid, but sometimes undulated.

Nearly all the specimens are a little flattened from compression, the greatest diameter being in the direction of the laminæ of the rock. A specimen one inch in diameter between the annulations measures about one-eighth of an inch more across the annulations. The distance of the annulations is not always uniform : in two specimens of nearly the same size, one has nine annulations in the space where the other has eight. In a specimen of an inch in diameter, the siphuncle measures a little over three-twentieths of an inch.

The ridges or annulations are direct, and, in this character, differs from the Niagara species, while the longitudinal striæ constitute another distinctive feature. This fossil is less tapering than the annulated species in the Hamilton group.

Geological formation and locality. In the Schoharie grit : at Schoharie and the Helderberg mountains.

ORTHOCEAS HYAS (n. s.).

A fragment in the same association as the preceding has a slightly smaller central siphuncle and less concave and more closely arranged septa, there being four in the space occupied by three in the former. The annulations are a little more abruptly elevated than in *O. thoas*, and are direct across the middle of the chamber, or equidistant between the septa.

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I have been unable to discover striæ of any kind, but the angular annulations between the septa are characteristic. The largest diameter of this specimen is one inch, and this length includes six annulations.

Geological formation and locality. In the Schoharie grit at Schoharie.

ORTHOCEAS MULTICINCTUM (n. s.).

SHELL cylindrical, very gradually enlarging from the apex : septa numerous; siphuncle small, central.

SURFACE annulated by numerous narrow ridges, the spaces between which are equal to once and a half or twice the diameter of the annulations : remains of longitudinal striæ are preserved on a part of the surface.

A specimen somewhat compressed, but which has had a diameter of about three-fourths of an inch, has thirteen annulations in the length of an inch; and at an inch nearer the apex, has fifteen annulations in the length of an inch. In the same specimen, however, the length of an inch from the aperture embraces only eight annulations. In a specimen measuring three-eighths of an inch in diameter, there are fifteen annulations in the length of half an inch.

From this great variation in the distance of the annulations, it might appear that this form is only a variety of *O. thoas*; but in numerous specimens of that species, having a diameter only one quarter greater than the largest individual of this species, the annulations show only the variation noted in the description, and I am therefore induced to regard them as distinct species.

Geological formation and locality. In the Schoharie grit : Schoharie.

ORTHOCEAS PROFUNDUM (n. s.).

SHELL cylindrical, gradually tapering from the aperture : outer chamber very deep; siphuncle apparently a little excentric.

SURFACE longitudinally marked by sharp ridges, which, in specimens of one inch to one inch and a half in diameter, are distant about one-tenth of an inch, and annulated by sharp, rather distant striæ, giving to the longitudinal ridges an undulated or crenulate aspect. The spaces between the transverse striæ are about one quarter as great as between the longitudinal striæ, but often show finer striæ of growth, and sometimes the sharper annulating striæ are not conspicuous.

This species differs in surface-marking from *O. imbricatum* of the Niagara group, in the absence of intermediate finer longitudinal striae; and from *O. virgatum*, in the more regular distribution of the longitudinal and stronger annulating striae.

In two individuals of an inch and a half diameter, the portion of the outer chamber preserved is nearly six inches in depth.

Geological formation and locality. In limestone of the Upper Helderberg group : Williamsville, N.Y.

ORTHOERAS SUBULATUM.

Orthoceras subulatum : HALL, Geol. Rep. 4th District New-York, 1843, p. 180, f. 1

This species, characteristic of the Marcellus shale, occurs in numerous localities, but usually in the form of casts. A single specimen from that rock, having the same proportions and flattened at the larger extremity, is finely cancellated by longitudinal undulating and transverse striae, which, at their junction, produce a granulose or papillose surface. The transverse striae are more crowded at regular intervals, and the surface is elevated in low ridges: this feature is slightly perceptible in the casts.

Geological formation and locality. In the Marcellus shale : Bloomfield; Avon; Schoharie, and elsewhere.

ORTHOERAS CONSTRICTUM.

Orthoceras constrictum : VANUXEM, Geol. Report Third District of New-York, 1842, p. 152, f. 1.

This species is common in the coarser shales of the Hamilton group, east of Cayuga lake. The specimens are not often larger than the one figured by Mr. VANUXEM. The constriction occurs usually at a point one inch to one and a half inches below the last septum: this feature is sometimes as abrupt as represented in the figure cited.

The siphuncle is small, central or very nearly so; the septa comparatively close, and very convex. There are apparently no surface-markings, except fine transverse striae.

A fragment where the diameter at the smaller end is a little less than half an inch, has ten chambers in the length of an inch; and another, of larger diameter, has nine chambers in the same length.

This species has a wide range. Specimens which do not differ in specific character from those in New-York, occur in Maryland.

Geological formation and locality. In the coarser shales of the Hamilton group: at Cazenovia, Hamilton, and elsewhere in New-York; and at Cumberland, Maryland.

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ORTHOERAS EXILE (n. s.).

SHELL elongate, cylindrical, very gradually tapering, broadly and gently constricted near the aperture, and swelling between that point and the commencement of the septa : aperture a little expanded ; septa distant, somewhat less than one-third the diameter, very convex. Siphuncle small, a little excentric.

SURFACE transversely striate.

This fossil is often mistaken for the *O. constrictum*; but if we are to take the figure of Mr. VANUXEM, with the abrupt constriction and closely arranged septa, that name is applicable to the preceding species. In the present one the constriction is always gentle, and often extends over the space of three-fourths of an inch ; the septa are much more distant, and the siphuncle larger and always excentric.

A specimen of this species, measuring nearly six inches long, has a length of the outer chamber of two inches, and a diameter, when not compressed, of about half an inch. In the first inch from the outer chamber, the septate portion has six chambers (not counting the narrow space next the outer cavity) ; the second inch has seven chambers, and the third has nine. A specimen from Cumberland (Maryland), with essentially the same characters, has five chambers in the length of an inch where the diameter is five-eighths of an inch. In numerous specimens of about the same proportions and character, the siphuncle is excentric.

Geological formation and locality. In the coarser shales of the Hamilton group at Cazenovia (New-York), and near Cumberland (Maryland).

ORTHOERAS CROTALUM (n. s.).

SHELL cylindrical, somewhat rapidly attenuate : septa numerous, moderately convex. Siphuncle central or subcentral.

SURFACE marked by strong annulations, which are a little undulating or bent backwards on one side, so as not to correspond with the line of the septa : these are crossed by fine even longitudinal striae, which are sometimes slightly undulated in passing over the annulations.

A specimen of a little more than half an inch in diameter, has seven or eight septa in the length of an inch. The annulations cross the shell in such a manner that nearly one half the circumference is upon one division or chamber, and a little more than half the circumference on the next lower one, and sometimes slightly affecting the next one below this. One, two, or three narrow chambers occur at the beginning of the septate portion, or

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adjacent to the outer chamber. A fragment two inches long and nearly three-fourths of an inch in diameter at the larger end, and less than half an inch at the smaller end, has somewhat more than eight annulations.

Geological formation and locality. In the soft shales of the Hamilton group : on the shore of Seneca lake, and at Ludlowville on Cayuga lake ; and in the coarser shales at Cazenovia, Hamilton, and other places in New-York.

ORTHOCERAS NUNTIUM (n. s.).

SHELL somewhat slender, very gradually tapering from the outer chamber : septa convex, the convexity nearly equal to twice the distance between the septa; siphuncle small, central.

SURFACE annulated by about one annulation to each septum; and the fine thread-like longitudinal striæ are crossed by fainter transverse striæ, which are more conspicuous near the aperture, but often scarcely visible on well-preserved specimens.

A specimen a little less than half an inch in diameter at the larger end, has sixteen annulations in the length of an inch and a half. Two other specimens, of about half an inch in diameter, have nine or ten annulations in the length of an inch. A specimen a quarter of an inch in diameter at the smaller end, has over thirteen annulations in the length of an inch. The annulations are slightly oblique to the axis ; but in a well-marked specimen, are limited to a single division, being on one side at the upper margin, and on the opposite side at the lower margin of the chamber, making the obliquity equal the distance between two septa.

This species is less rapidly attenuate than the preceding ; the annulations sharper, and twice as numerous on specimens of the same size. The numerous annulations, and their relations to the septa, are distinctive characters. The shell tapers less rapidly than *O. crotalum*.

This and the preceding species bear a very close relation to *O. ibex* (SOWERBY), or *O. ibex* and *O. articulatum* as united ; but I am unable to identify them satisfactorily.

Geological formation and locality. In the soft shales of the Hamilton group : on the shores of Seneca lake ; and in the coarser shales east of Cayuga lake.

ORTHOCEAS PERELEGANS?

Compare *Orthoceras perelegans* : SALTER, Memoirs of the Geol. Survey of Great Britain, Vol. ii, part i, pag. 354, pl. 13, f. 2, 3, 4.

SHELL cylindrical, gradually tapering : siphuncle central.

SURFACE undulated by rounded, subundulating or slightly oblique ridges, and marked by fine striæ of growth which are essentially parallel to the annulations; without longitudinal striæ.

I have seen but a single fragment of this species, from the Hamilton group : it differs conspicuously from the preceding species, in the absence of longitudinal striæ, and usually in the more numerous annulations in the same space. Without more specimens, I have not the means of finding any specific difference between this and the species of Mr. SALTER.

Geological formation and locality. In the coarse shales of the Hamilton group : near Hamilton, Madison county, N.Y.

ORTHOCEAS ÆGEA (n.s.).

SHELL cylindrical, gradually tapering : septa distant, very convex; siphuncle central?

SURFACE undulated by broad undefined annulations, crossed by prominent longitudinal rounded striæ, which are distant from each other, with a fainter one between. Transverse striæ obscure in the specimen examined.

This species differs from *O. profundum* of the Upper Helderberg limestone, in its surface-markings, in the rounded character of the longitudinal striæ, and in the presence of the intermediate finer striæ : the broad undefined annulations are also a marked feature, though this may not be constant in all parts of the shell.

Geological formation and locality. In the calcareous beds of the Hamilton group in Madison county, N.Y.

SUPPLEMENTARY NOTE
TO PAGES 95 AND 96 OF THE THIRTEENTH ANNUAL REPORT OF THE
REGENTS ON THE STATE CABINET.

DURING the studies and comparisons of the fossils described in the preceding pages, I have discovered among my collections from Licking county (Ohio) a specimen of the *Goniatites hyas*, which I have described from Rockford (Indiana). This specimen is from the yellow sandstones and olive shale and sandstone group known as the Waverly sandstone series of Ohio, and which is the equivalent or continuation of the Portage and Chemung groups of New-York. From the usually limited vertical range of GONIATITES in our strata, the occurrence of this fossil in such a position induces me to conclude that the position assigned to the Goniatite beds of Rockford may be erroneous, and that the true position is higher in the series, or more nearly in a parallel with the Chemung group; for I can hardly suppose that a species of Goniatite common in beds of the age of the Hamilton group would range so high as the Chemung group.

The similarity of one or two of these Goniatites with Carboniferous forms of Europe renders the question regarding the position of the Goniatite beds of Rockford a matter of much interest; and during the Geological Survey of Iowa, I directed Mr. WORTHEN, then connected with that survey, to make a section across the country, taking the locality of these beds in his way, with a view of determining their true position. He however failed to obtain an actual section from exposures of the strata at the locality; but his observations elsewhere, in connexion with those made by myself, compelled me to the conclusion that the Rockford beds were below the sandstones, which, in the Ohio and farther west, were regarded as the continuation of the Chemung group.

I am satisfied, from my own observations in other localities, that the Goniatite beds of Rockford are associated with, or lie directly above the Black slate; and that this Black slate, on the Ohio river, apparently succeeds in direct sequence the limestone which is clearly a continuation of the Upper Helderberg limestone of New-York. As the Hamilton group has not been recognized in the south part of Ohio or Indiana, so far as I know, there may yet be room for doubt as to whether this group thins out beneath the black shale or above it; or, in other words, whether the Black shale of Southern Ohio and Indiana, and of Kentucky and Tennessee, may be the continuation of the Marcellus shale or the Genesee slate of New-York. For, as I have said elsewhere*, this rock, "from position, seems to be the equivalent of the Marcellus shale of New-York, and is the only representative of that rock, the Hamilton group, and the Genesee slate; for we pass directly from this to the green shales or slaty sandstones of the Portage group or Waverly sandstones of Ohio."

The discovery of this GONIATITE in the latter series of Ohio suggests anew the question regarding the age of the black slate near the Falls of the Ohio.

* Transactions of the Am. Assoc. of Geologists and Naturalists, 1841 & 1842, p. 280.

PRELIMINARY NOTICE

OF THE

TRILOBITES AND OTHER CRUSTACEA OF THE UPPER HELDERBERG, HAMILTON AND CHEMUNG GROUPS.

[Published September 1861.]

THE TRILOBITES were among the fossils which early attracted the attention of American and other naturalists; and specimens had been sent by Prof. DUCATEL of Maryland and Dr. HOSACK of New-York to Prof. BRONGNIART at Paris, and were in his hands when he published his "*Histoire Naturelle des Crustacés fossiles.*" Among those who have described trilobites from the rocks of the United States, and particularly from New-York, or species known in this State, are MR. STOKES, DR. BIGSBY, DR. DE KAY, DR. JACOB GREEN*, and PROF. A. EATON. During the Geological Survey of this State, MR. CONRAD described several species in his annual reports upon the palæontology; and others have been published in the first, second and third volumes of the Palæontology of New-York, embracing those known in the Lower and Upper Silurian strata. The following species are all that are at present known to me in the higher groups, or the rocks corresponding to the Devonian System of Europe.

TRILOBITES.

GENUS CALYMENE (BRONGNIART).

CALYMENE PLATYS (GREEN).

Calymene platys : GREEN. Monograph, p. 32.

This species was described by DR. GREEN from a cast taken in a natural mould left by the fossil in the rock, which is its more common mode of occurrence. Since that time, two or three specimens of the fossil, retaining portions of the crust, have been found at Schoharie by MR. GEBHARD, and are now in the State Cabinet.

The form is similar to *C. blumenbachii*; but certain differences, and particularly the form of the hypostoma, distinguish it from that species.

Geological formation and locality. In the Schoharie grit : in the Helderberg mountains, and at Schoharie.

* Monograph of the Trilobites of North America, with colored models of the species By JACOB GREEN, M.D. etc. 1822.

GENUS DALMANIA (EMMRICH).

DALMANIA ANCHIOPS (GREEN, sp.).

Calymene : Cited with doubt by BRONGNIART as *C. macrophtalma* (Crus. fos. p. 16).

Calymene anchorops : GREEN, Monograph, p. 35.

Asaphus laticostatus : GREEN, Ibid. p. 40.

Phacops anchorops : HALL, in Foster & Whitney's Report of Lake Superior, p. 124*.

This species, in the condition of fragments and casts, is not unfrequent in the Schoharie grit of New-York. The original specimen is a partial cast of the interior of the crust : the crust is removed from the greater part of the head and mainly from the axis, presenting but a narrow border on the lower margin, and no portion of the surface is entire. The axis is a little more than half as wide as the lateral lobes : in the caudal portion, it has about thirteen rings ; and the lateral lobes have nine ribs, the last one parallel to the axis. The frontal lobe of the glabella is wide across the middle, somewhat narrowed and almost pointed anteriorly, and abruptly contracted in front of the eyes.

In the specimens, which are all casts, the anterior and middle lobes appear as a single prominence, and the posterior lobe is very obscure. Sharp indentations mark the longitudinal furrow. The border of the head is prolonged posteriorly into spines ; and, although not positively determinable in the specimens before me, it seems probable that the anterior border has been produced, either as an acute extension, or as a distinct process in front, while the centre of the occipital ring is produced into a short spine. These characters, however, are not visible in the original specimen.

In a small entire caudal shield there is a posterior spine of full one quarter of an inch : the rings of the axis, and the lateral ribs in this one are tuberculated. The caudal shield of the original fossil measures about one inch and three-fourths across the anterior margin, with a length of about one inch. In an impression in the stone, and still retaining part of the crust, and a little larger than the original specimen, the length of the caudal spine is five-eighths of an inch. Casts of the caudal shield, measuring from two and a half to three inches, are not uncommon in the Schoharie grit ; and it is one of these, which is the typical specimen of GREEN'S *Asaphus laticostatus*.

The plaster cast of *A. laticostatus*, referred to in GREEN'S Monograph, measures a little more than three inches in diameter, and is nearly two inches and a quarter in length.

Geological formation and locality. In the Schoharie grit at Schoharie, and in the Helderberg mountains.

* At the time of writing for that Report, I had not seen the generic description of DALMANIA : these forms have been previously united under PHACOPS.

DALMANIA ANCHIOPS, var. ARMATA.

Among the specimens in the State Collection from Schoharie, there is a portion of the head of a Trilobite resembling the *Dalmania anchiops*. The diameter across the base has been fully three inches : the occipital ring bears a strong rounded spine, which has been an inch and a quarter long ; and the transverse diameter, at its junction with the annulation, is half an inch.

In a well-marked head of *D. anchiops*, more than two inches in diameter, the occipital spine is less than a quarter of an inch.

For the present, I propose to indicate the form with the strong spine as a variety, *D. armata*.

Geological formation and locality. In the Schoharie grit : Schoharie.

DALMANIA SELENURUS.

Asaphus selenurus : EATON, Geol. Textbook, 1832.

Calymene? odontocephala : GREEN, Supp. to Monograph, etc. p. 9.

Odontocephalus selenurus : CONRAD, Ann. Rep. Palaeontology N.York, 1840, p. 204.

— — : VANUXEM, Geol. Report Third District New-York, 1842, pp. 139 & 140, f. 1.

— — : HALL, Geol. Rep. Fourth District New-York, 1843.

Dalmania selenurus : HALL, Corrected List of Fossils, Twelfth Annual Report of Regents on the State Cabinet, p. 88.

This species, originally described by Prof. EATON from a specimen of the caudal shield, is regarded as a characteristic species of the Corniferous limestone of the Helderberg mountains. The caudal extremity is produced into two short spines, leaving the posterior margin crescentiform, whence its name. At the time of the original description of the species, the head had not been determined. Dr. GREEN, however, obtained a separate head, which he described under the name of *Calymene odontocephala*. Subsequently, in 1840, Mr. CONRAD saw an entire specimen from Auburn, showing that the head and tail, which had been referred to different genera and species, were in reality parts of the same trilobite. Since that period, several entire specimens have been obtained, and the species is supposed to be well known.

In the examination of the specimens usually referred to *D. selenurus*, I find some characters incompatible with a single species.

The original description was founded on specimens of the caudal shield obtained in the Helderberg mountains and at Schoharie ; and in examining authentic specimens, I find the anterior border of individuals from these localities to be margined by ten toothlike processes forming a fimbriated or denticulated edge, from which the name *Odontocephalus* was suggested. These apparent denticulations are produced by oval indentations or perforations through a wide frontal border ; and though they appear separated,

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they may perhaps sometimes be united at their outer extremities. In the Helderberg species these processes are strong, and much expanded at the outer extremities, and the posterior angle of the border but little produced. The frontal lobe of the glabella is broad and strong, having a transverse diameter of about once and a half the length. The eyes are very prominent, of medium size, with six and sometimes seven lenses in the vertical line and ten or eleven in the diagonal line. The caudal shield in well-preserved individuals shows ten or eleven rings, and sometimes a faint indication of another : the lateral lobes show ten ribs terminating in a wide border, which is marked by the furrows turning abruptly backwards at the end of the ribs. The last rib is short, and directed obliquely outwards from a little above the base of the axis, dying out in the wide posterior border, which is truncated or slightly concave in the centre, and the lateral angles produced into rounded spines sometimes a quarter of an inch in length.

This species is sometimes four inches or more long, and somewhat more than two inches wide. In a specimen four inches in length, the caudal shield, including the spine, is one inch and a quarter long, and one inch and three quarters at the anterior margin : the axis of the same specimen is three-fourths of an inch in its widest part, and the width of the glabella at its base is half an inch.

Geological formation and locality. In the Corniferous limestone of the Upper Helderberg group in the Helderberg mountains ; at Schoharie, and Auburn, N.Y.

DALMANIA ÆGERIA (n.s.).

SHELL semielliptical : whole length nearly twice the width ; the length from the occipital ring to the anterior margin, a little greater than half the width; the border, at the posterior angles, produced into elongate slender spine-like processes, and anteriorly it is fringed by eleven processes, a central one and five on each side. Frontal lobe of the glabella subrhomboidal, a little extended in the middle in front, the lateral extension being scarcely as far as a vertical line drawn through the middle of the eye. The first and second lateral lobes are nearly equal, the last one smaller : the occipital furrow is strongly marked. The axis is about half as wide as the lateral lobes, and moderately prominent. The lateral lobes are flat for about half their width, and bend abruptly downwards at the sides.

The caudal shield is nearly as long as the head; the axis marked by twelve or thirteen rings, and thirteen or fourteen are visible in the cast; the lateral lobes have eleven distinct ribs, and one

or two indistinct ones which are parallel to the axis. The border beyond the axis is flattened and spreading, concave on the posterior margin, and the angles slightly produced in flattened spiniform processes. Surface granulose.

This species differs from the *D. selenurus*, in the form and proportions of the head; the prolongation of the posterior angles of the border of the buckler, which reaches sometimes to the fifth articulation of the body; the greater extension of the fringed border, and the more pointed form in front. The fringe-like appendages are more in number, and are separated by narrower spaces: in the caudal shield, there are a larger number of rings on the axis; but the most distinctive features of this part of the crust are the direction of the ribs in the lateral lobes, and the wide concave posterior margin with scarcely extended spines.

In one nearly entire specimen; in two separated heads; and several caudal shields, the above described characters are constant; and these specimens, with a single exception, are all from the western part of the State.

Geological formation and locality. In the limestone of the Upper Helderberg group: at Williamsville and Clarence-hollow, and at Chittenango, New-York.

DALMANIA CORONATA (n. s.).

ENTIRE BODY subelliptical: length and width nearly as two to three, moderately convex; the apex rounded and rising gently above the lateral lobes, which are flattened for more than half their width. Head lunate, the length less than half its width. The posterior angles of the border not produced: anterior border ornamented with nine short tooth-like processes; a central one, and four on each side. Frontal lobe of the glabella short and wide: anterior and middle lobes nearly equal, the dividing furrow marked only at the side of the axis; posterior lobe short and well defined towards the axis; occipital furrow narrow; occipital ring wide and strong. Eyes small, prominent, with about five lenses in the vertical rows.

The axis of the thorax is but little narrower than the lateral lobes; the annulations somewhat flattened, and spreading towards the extremities. The lateral lobes are flattened or a little concave towards the axis, and, in their natural position, are bent abruptly from the middle towards the exterior margins. The pygidium is somewhat semicircular, emarginate, and a little concave behind: the width, in a somewhat flattened specimen, is a little more than

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twice the length. Eight distinct rings mark the axis, with two or three indistinct ones below : the posterior extremity is rounded and obtuse, and separated from the expanded border by a marked groove. The lateral lobes are marked by ten ribs, which terminate in a moderately wide border. The grooves between the ribs are rounded, well defined, and wider at their abrupt termination on the border. The posterior border is obtusely angular on the margin in the direction of the rib next to the last on each side, and a little concave on the exterior between these points, and appearing as if bent upwards, having a slightly arching contour when viewed in profile from behind.

This species resembles the *D. selenurus* and *D. ægeria*; but the head is less extended in front, the denticulations are shorter, and apparently but nine in number; and the caudal extremity is broadly emarginate or slightly concave, but has no spiniform processes. There are other minor distinctions, which will be shown in final illustrations.

Geological formation and locality. In the Hamilton group : near Skeateles lake, N.Y.

DALMANIA MACROPS (n.s.).

HEAD short, lunate : frontal lobe of glabella very wide, nearly twice as wide as long; anterior and middle lobes nearly equal; posterior lobe small; occipital ring large. Eyes proportionally very large; the elevation of the one measured being $\frac{35}{100}$ of an inch, the longitudinal diameter at base $\frac{40}{100}$, and at summit $\frac{30}{100}$. There are sixteen or more lenses in a vertical line; thirty-four ranges can be counted, and there are apparently one or two more : the lenses are prominent, and their area not limited by elevated lines.

The only specimen positively determined to belong to this species, is an imperfect head : this is distinguished from *D. selenurus* and *D. ægeria* by the broader frontal lobe of the glabella, and proportionally much larger eye ; it differs from *D. adspectans* in the broader base and less elevation of the eye, and the larger and more prominent lenses.

Geological formation and locality. In limestone of the Upper Helderberg group : Schoharie.

DALMANIA ADSPECTANS.

Asaphus adspectans : CONRAD, Annual Report Palaeontology of New-York, 1841,
pa. 49, pl. 1, f. 9.

DESCRIPTION. "A small portion of the buckler and one eye only is
"visible; but the eye is of an extraordinary height, the margins
"parallel, and the lenses arranged in parallel longitudinal lines,
"small and very numerous."

The eye of this trilobite is remarkably elevated and subcylindrical, measuring $\frac{4}{10}$ of an inch in height, $\frac{3}{10}$ in diameter at the base, and $\frac{2}{10}$ at the summit. Lenses very small, depressed, and surrounded by an elevated line enclosing a hexagonal area. There are twenty-two lenses in a vertical line from base to top, and as many as thirty rows can be counted in one specimen : in another specimen the eye is a little smaller, and has twenty or twenty-one ranges of lenses in a vertical line. The portion of cheek remaining is strongly tuberculated.

Geological formation and locality. In the limestone of the Upper Helderberg group : Schoharie and the Helderberg mountains.

DALMANIA MYRMECOPHORUS (GREEN, sp.).

Asaphus myrmecophorus : GREEN, in Amer. Jour. Sci. and Arts; and Supplement to
Monograph of Trilobites, p. 16.

The specimen from which Professor GREEN described this species was a fragment of the pygidium, preserving "thirteen costal arches and fourteen joints of the middle lobe." So far as I am aware, no entire specimen has ever been found ; and all the fragments yet positively identified with this species consist of parts, or nearly entire specimens of the pygidium. In one specimen about three inches in length, twenty-four annulations can be counted in the axis, and probably there were one or two more ; and in the same specimen, twenty ribs may be counted in the lateral lobes. At the anterior extremity, the axis is a little more than one-third as wide as the lateral lobe. In one specimen, the width of the axis at the anterior border of the pygidium is one inch and a quarter in diameter, and the lateral lobe is more than three inches wide : when entire, the specimen must have been nearly eight inches wide.

The contour of the pygidium is moderately convex, the axis rising but little above the convexity of the lateral lobes : these are concave towards the axis ; but within a distance of half the width of the axis from the dorsal furrow they acquire their greatest convexity (which is increased by a row of nodes), and slope with a gradual curve to near the margin, when they become a little concave from the slight bending upwards of the margin. The rings of the axis are strong, convex, and marked each by three spines. The ribs are simple, gradually expanding towards the margin, and

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marked by an interrupted row of nodes, and sometimes by two unequal rows of nodes : in the perfect crust, these nodes may have been produced into spines. The border is narrowly thickened, sinuate on the margin, and, at the extremities of the ribs, is produced into long slender curving spines. Margin of the caudal extremity concave.

From the dimensions of the pygidium, this species has been by far the largest trilobite in the higher rocks of our system.

Geological formation and locality. In the limestone of the Upper Helderberg group : in the Helderberg mountains ; Schoharie ; and in Genesee county, N.Y.

DALMANIA HELENA (n.s.)

PYGIDIUM large, subtriangular, depressed-convex, the axis little elevated, the posterior extremity bending upwards, and the border concave or emarginate : the axis tapers gradually; its width at the anterior end is equal to half the width of the lateral lobes, marked by twenty-one or twenty-two annulations (some of the posterior ones being perceptible in the cast). Lateral lobes marked by eighteen or nineteen ribs, which terminate in a narrow, thickened, somewhat undulating border.

SURFACE granulose; the ribs marked by two rows of nodes or short spines.

The description of this species was prepared for the press before I had had an opportunity of seeing anything more than fragments of the *D. myrmecophorus*, and the similarity between the two is very marked ; but unless that one is subject to extreme variations, this is a distinct species. The length and width of the pygidium are about as two to three, while in *D. myrmecophorus* the width is twice the length : the width of the axis in that species is a little more than one-third the width of the lateral lobe ; and in this one, the axis measures half the width of the lateral lobe.

Geological formation and locality. In limestone of the Upper Helderberg group : near Columbus (Ohio), and in New-York.

DALMANIA CALYPSO (n.s.)^m

PYGIDIUM paraboloid, very convex, the axis sharply angular : annulations about fifteen or sixteen (the posterior ones visible in the cast), surmounted by a row of short spines. Lateral lobes marked by twelve or thirteen gently curving narrow ribs, which terminate in a well defined border of moderate width. Length of specimen one inch : width across the anterior margin, nearly one inch and three-eighths.

This species is well characterized by the convexity of the pygidium, and angular axis with the crest of short spines.

Geological formation and locality. In limestone of the Upper Helderberg group : Falls of Ohio, in Stratum V of Mr. LYON's section*. From S. S. LYON, of Jeffersonville.

DALMANIA PLEIONE (n. s.).

PYGIDIUM convex : axis prominent. Lateral lobes flattened near the axis, and abruptly bent downwards at the sides. Axis marked by about nine or ten rings; the lateral lobes marked by five or six ribs, five of which on each side are prolonged into sharp rounded spines, and the caudal extremity produced in a short wide triangular process, which is not more than half the length of the lateral spines.

This species belongs to the group of which the *Dalmania (Cryphaeus) boothii* may be regarded as the type : it has the pygidium more convex than that species, and the lateral spines are proportionally larger, more rounded and more widely spreading, while the caudal prolongation is a short deltoid process.

Geological formation and locality. In limestone of the age of the Upper Helderberg group, at the Falls of the Ohio.

DALMANIA ERINA (n. s.).

PYGIDIUM paraboloid : length and width, at the anterior side, about as three to four; axis very prominent, subangular, slightly compressed along the sides, marked by fourteen or fifteen rings. Lateral lobes nearly flat for more than half their width, bending abruptly downwards at the sides. Ribs twelve or thirteen, terminating abruptly in a spreading border which is scarcely marked by the furrows beyond the ribs : a faint impressed line along the centre of the ribs from the outer extremity to near the longitudinal furrow, where it bends gently downwards to the lower side. SURFACE finely granulose.

This species is readily distinguished from either of the preceding, by the prominent axis, wide and plain border, and surface without nodes or spines. The most characteristic specimen has a width, at the anterior margin of the pygidium, of one inch, and a length of three-fourths of an inch.

Geological formation and locality. In limestone of the Upper Helderberg group, at Williamsville, N.Y.

* Transactions of the Academy of Sciences of St. Louis, Vol. i, p. 614.

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DALMANIA BIFIDA (n. s.).

PYGIDIUM small : width about once and a half the length, exclusive of the caudal extension. Axis moderately convex, marked by about nine or ten rings (perhaps, in well-preserved specimens, there may be one or two more). Lateral lobes marked by nine or ten ribs, which are grooved along the middle and terminate in a thickened border : on the posterior side the border is extended beyond the axis a distance equal to half the length of the latter, gradually narrowing, and the extremity distinctly bifid for half its length. Surface granulose.

Geological formation and locality. In the limestone of the Upper Helderberg group at Stafford. Collected by C. A. WHITE.

DALMANIA BOOTHII.

Cryphæus boothii : GREEN, Silliman's Am. Journal of Science, Vol. 32, p. 344.

C. calliteles : ID. Ib. p. 346.

C. greeni : CONRAD, Ann. Report Palæontology of New-York, 1839, p. 66.

Asaphus halli [?] : ID. Ib. p. 104.

The species originally described by Prof. GREEN are from strata of the age of the Hamilton group of New-York, and the common form in our rocks has usually been referred to the *C. calliteles*.

After examining at least one hundred specimens in various degrees of perfection, some of them nearly or quite entire, others which are the separated heads and pygidia, I am unable to point out any specific distinction among the specimens of that form in New-York to which Professor GREEN applied the name *CRYPHÆUS*. The peculiar ornamentation, caused by the extension of the ribs of the pygidium beyond the border, presents some degree of variation, but is not accompanied by other characters which would induce me to distinguish these varieties as species. In several nearly entire specimens of small and medium size, I find all the characters described by GREEN as those of *C. boothii* and *C. calliteles*.

In the pygidia of larger specimens, the characters of *C. calliteles* are observed. In still other specimens, I observe important features, which, if the reference be correct, have been overlooked in the former descriptions. In the specimens before me, the entire length is less than twice the width ; the head is very nearly semicircular, exclusive of the anterior border which is a little produced, and the posterior angles which are extended into wide flattened spines as far as the fifth rib of the thorax. The glabella is subovate, the longitudinal furrows being produced in nearly a straight diverging line from the base to the outer extension of the frontal lobe.

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The frontal lobe of the glabella, in well-preserved specimens, is nearly twice as wide as long ; the anterior furrow is very oblique, and sharply impressed ; the median furrow is nearly rectangular, sharply impressed, and sometimes not reaching the longitudinal groove ; the posterior groove is a little inclined backwards, and reaches the margin of the glabella ; the occipital furrow is well defined at the sides and upon the cheeks, but less strongly in the centre. The occipital ring is strong and wide, prominent in the centre, and sometimes rising into a tubercle or short spine. Eyes prominent, rising much above the summit of the glabella, and, on that side, sloping abruptly to the dorsal furrow : five or six, and rarely seven lenses may be counted in the vertical line, and twenty-five rows ; the anterior and posterior rows with two, three and four lenses. The lenses are prominent, and surrounded by a depressed circular line.

In the thorax, the axis is rounded, prominent, and a little narrower than the lateral lobes ; the lateral lobes flat for half their width, and sloping abruptly to the margins. (This character, and the convexity and comparative width of axis, depend much on the degree of compression which the fossil has suffered.)

The pygidium is broad, semielliptical approaching to semicircular ; the axis prominent and tapering to a rounded extremity, marked by nine or ten (sometimes eleven or twelve) rings ; the lateral lobes marked by five ribs, which are separated by a deep groove, and the summit of each marked by a linear groove terminating at the border : the ribs are extended beyond in flattened foliate expansions, which are gently curved backwards. The centre or caudal prolongation is wider and shorter than the others.

Surface granulose or papillose ; and, upon the fimbriate extremities, the papillæ are elongated.

In the larger specimens of pygidia, there are twelve or fourteen and even sixteen rings. The fimbriae are produced in wide lanceolate extensions, and are strongly pustulose. When the crust is removed, there is a deep groove limiting the extension of the ribs of the pygidium, and the impressions of the fimbriae are shown beyond this. A separated portion of the crust shows, that at the base of these fimbriae, the border is abruptly thickened with an angular lower edge. The external surface presents some variations of character which have not been noticed, so far as I know. The occipital ring is often surmounted by a tubercle or spine, and the second ring of the axis of the pygidium in like manner : sometimes several rings of the pygidium are thus marked with more minute spines. Again we find the occipital ring, all the annulations of the thorax, and many of those of the pygidium, marked by short spines.

I am not yet able to determine that the presence or absence of these spines is of specific importance. In the specimens heretofore described, the imperfection of the crust may have prevented the discovery of spines ; and it is scarcely possible to constitute a new species upon this character, from strata whence three have already been described.

I am unable to find any characters in the Moravia specimens, to separate them from the others. I cannot therefore recognize the *Cryphaeus greeni* as a distinct species. The CRYPHÆUS is common at York ; and I am induced to believe that the specimens referred to *Asaphus halli* are this fossil with the fimbria removed, or the border separated. Extensive collections from York have not served to produce any other Trilobites than the DALMANIA (CRYPHÆUS) and PHACOPS.

Geological formation and locality. In the Hamilton group : at Hamilton ; shores of Cayuga, Seneca and Canandaigua lakes ; Geneseo, Moscow, York, Pavilion ; and at Eighteen-mile creek on Lake Erie.

GENUS PHACOPS (EMMRICH).

PHACOPS BUFO (GREEN, sp.)

Calymene bufo : GREEN, Monograph, p. 41.

The geological position of this species is not stated by Dr. GREEN, but it is said to have been found in New-Jersey in a dark greyish limestone.

PHACOPS RANA (GREEN, sp.).

Calymene bufo, var. *rana* : GREEN, Monograph, p. 42.

Prof. GREEN has described (Monograph, p. 41) the *Calymene bufo*, the original of which is a specimen having "a length of four inches and a half," and "the breadth of the buckler nearly two inches."

I have never seen, in the rocks of New-York, an entire specimen of this genus having a length of more than two and a half inches. Some separated heads are an inch and an eighth long, and the length of the head in the common species is about one-third the entire length of the animal, which would give a length of less than three and a half inches for the largest specimen. The proportions of *C. bufo* do not agree with any specimens in the Upper Helderberg rocks or in the Hamilton group.

In an individual from the Hamilton group, of two and a quarter inches long, the width of buckler at base is one inch and a quarter ; and in another of one inch and a half long, the width is about seven-eighths of an inch. The proportions given by GREEN would clearly indicate his *C. bufo* as a distinct species.

The *Calymene bufo*, var. *rana*, is cited by the same author as occurring at Seneca, Ontario county, N.Y.; which locality is in the shales of the Hamilton group. Specimens are common, and sometimes abundant in the shales of the Hamilton group ; and a species, which I regard as identical with this, occurs in the upper limestone of the Upper Helderberg group.

PHACOPS RANA. Body elongate; length three times the width; sides nearly straight; head almost perfectly semicircular, except that the posterior angles project beyond the line. Glabella very gibbous, wider than long, with faint marks of the lateral lobes. At the basal angles of the glabella are rounded or ovoid tubercles, and, below the centre, a transverse elevation, with a few small papillæ like those of the surface: the occipital furrow is narrow, and the occipital ring wide and strong; cheeks spreading and rounded at their posterior extremities; the border is every where narrow and even. The eyes are of moderate size and neatly placed, rising nearly as high as the plane of the top of the glabella in well preserved specimens. In young specimens, there are five and rarely six lenses in the vertical rows; while in older specimens there are usually four lenses, the thickening of the palpebral lobe having obscured them. In a well-preserved specimen of medium size, the eyes (beginning on the anterior side) have one vertical row with four lenses, nine rows with five each, two rows with four each, two rows with three each, two rows with two each, and one lens in the posterior angle, giving altogether sixty-eight lenses in each eye.

The length of the thorax is equal to the width at the posterior end, which is about a seventh or eighth narrower than the anterior end. The axis is regularly rounded and moderately elevated; the lateral lobes flat for half their width, and somewhat abruptly bending at the sides. The pygidium is more than twice as wide as long; the axis marked by eight or nine, and rarely by ten rings. Seven or eight ribs may be counted in the lateral lobes of young specimens, the posterior ones becoming obsolete in older individuals.

This species occurs in large numbers, and specimens have been found from the size of half an inch to nearly three inches in length; and from measurements of separate heads and bodies, we infer that individuals have been three inches and a half long. It agrees more nearly with the *Phacops secundus* of BARRANDE, than with any other species known to me; and it would not be difficult to establish two or three varieties among our specimens.

Geological formation and locality. In the limestone of the Upper Helderberg group: in the Helderberg mountains, Schoharie, and throughout New-York; and in the Hamilton group everywhere, but more particularly in Central and Western New-York, as at Seneca and Cayuga lakes, Moscow, Geneseo, and other places.

A specimen from Iowa, which I suppose to be from the same geological position, presents no important points of difference.

PHACOPS CRISTATA (n. s.).

ENTIRE BODY elongate; length a little more than twice the breadth.

Head nearly semicircular; width a little more than twice the length. Thorax about one-seventh longer than wide. Pygidium semielliptical, about two-thirds as long as wide. Glabella prominent, ventricose, the longitudinal furrow separating the eye very narrow; neck small; occipital ring furnished with a small prominent spine. Eye prominent, narrow above, having six or seven lenses in the central vertical rows, and thirteen or fourteen rows from the anterior to the posterior side : the anterior angle has a single lens. Axis of the thorax prominent, angular, semielliptical, and marked by eight or more rounded rings, the summit of each ring having a short vertical spine. Lateral lobes flat for half their width and bent abruptly downwards, marked by six or seven ribs.

SURFACE granulose; the glabella papillose or tuberculous.

This species is readily distinguished by the crest of spines upon the back, and, in the separated heads, by the spine upon the occipital ring, which is very conspicuous even in the casts. The eyes are proportionally narrower and higher than in *P. bufo*, var. *rana*; the number of lenses in the vertical rows being more, while in the lateral direction there are fewer rows.

There is evidence of still another species in the same geological association, which may be indicated by the anterior extension of the frontal lobe of the glabella.

Geological formation and locality. In the Schoharie grit : Helderberg mountains and Schoharie.

The most satisfactory specimen for examination, which I have seen, is a mould in the gritstone which preserves the impressions of all the parts : this specimen is in the Cabinet of the Albany Institute. Besides well-marked fragments of the head, I have an entire specimen from which the crust is removed, received many years since as coming from the Schoharie grit, and the condition of the specimen corroborates that opinion ; but, unfortunately, the distinguishing specific features are mainly obliterated.

PHACOPS BOMBIFRONS (n. s.).

In the limestone of the Helderberg mountains, there is a PHACOPS which cannot be identified with any of the varieties of *P. bufo*, or *P. bufo*, var. *rana*. The specimens which I have seen are separated heads, with a very prominent glabella, a neck wider than in the *P. cristata*, a narrow furrow between the eye and the glabella ; the eye elevated and narrower than in *P. rana*, with the palpebral lobe more prominent. The limitation of the 1861.]

lens-area in the cast is elliptical ; and there are about five lenses in the central vertical lines, and laterally about twelve or thirteen rows, with a single lens in the posterior angle.

The glabella is strongly tuberculated ; the cheek-border in the lower side strongly denticulated, as many as seven denticulations between the antero-lateral extension of the glabella and the posterior angle of the border ; the posterior angle rounded, with a short spine or node-like process about half-way between the eye and the posterior margin.

Geological formation and locality. In the limestone of the Upper Helderberg group : Helderberg mountains, Albany county, N.Y.

PHACOPS CACAPONA (n. s.).

In some collections obtained many years since from a friend in Georgetown, D.C., are two specimens of PHACOPS, labelled "from the mouth of Capon river, near its junction with the Potomac." These specimens are clearly distinct from any species in New-York : they are partial casts, but preserve some of the surface-characters. The glabella is short and wide, and three tubercles are preserved in the occipital furrow. The eyes are much elevated : there are seven lenses in many of the vertical rows, and nineteen rows may be counted laterally, the one in the posterior angle having two lenses. The body is broad, the width in a coiled specimen being equal to the length : the axis is comparatively broad and rounded, nearly as wide as the lateral lobe. The caudal shield is undeterminable. The surface of the glabella is marked by rounded tubercles, which are distributed with some degree of regularity.

The proportions of the body are distinguishing features ; but the form of the eye, the number and arrangement of the lenses are more distinctive, when compared with either of the other species. The specimens are converted into a reddish grey siliceous material.

This species may perhaps be identical with that sent by Prof. DUCATEL to Prof. BRONGNIART, and indicated by him as *Calymene macrophtalma*; but the specimen figured on Plate i, fig. 4, of the "Crustacés fossiles," is certainly not identical with this one.

The large specimen (a cast in plaster sent by Dr. HOSACK), indicated by M. BRONGNIART as coming from the United States, is the original of Prof. GREEN's *Calymene anchiops*, a DALMANIA as already indicated in this paper.

When compared with the cast of *P. bufo* of GREEN, the greater proportional breadth becomes a distinguishing feature, and the glabella is much less produced anteriorly. The form and proportions of the eye in the cast do not furnish any means of comparison.

Geological formation and locality. The locality named "Mouth of the Capon river near the Potomac," indicates a geological horizon of the Upper Helderberg or Hamilton group.

GENUS PROETUS (STEININGER).

The Genus PROETUS acquires its greatest development, in this country, in the Upper Helderberg and Hamilton groups. Regarding these as the equivalents of the Devonian in Europe, this result is not in accordance with that obtained by M. BARRANDE, who shows by far the greatest development of species of this genus in Upper Silurian strata, and a great diminution of species in the Devonian rocks.

In the United States, as far as I know, species of this genus are rare in the strata below the Schoharie grit. The species before me at this time, with a single exception, have ten articulations in the thorax. Although several species have granulose or papillose surfaces, I have not discovered spines or lateral appendages upon any of them. Of the species described, seven are entire specimens; the others consist of heads or of pygidia, and of the thorax and pygidium.

PROETUS CONRADI (n. s.).

BODY oval; length less than twice the width. Head nearly semi-circular: the border is wide, a little convex, gently sloping towards the margin, and prolonged behind as far as the middle of the thorax. The furrow in the crust is a simple rectangular depression of the surface, but, in the cast, becomes an abrupt groove, with the inner side straight and the outer side strongly curving. Glabella convex, somewhat ovoid, narrower in front, a little longer than wide: lateral furrows obscure, the posterior one curving from nearly opposite the centre of the eye backwards to near the base. The facial suture bends a little outward from the eye, and curves inwards towards the margin. The eye is large and well developed, and somewhat elongate.

THORAX consisting of ten segments; the axis prominent and semi-circular, the annulations direct; the lateral lobes flat or slightly convex for a third of their width; the ribs marked by a sharply defined furrow; the anterior limit narrower and very angular on the anterior margin, filling a slight depression in the posterior margin of the posterior limb: extremities obtuse.

PYGIUM semicircular; the axis very prominent, and forming about one-third the width at the anterior margin and three-fourths the entire length; marked by ten or eleven rings, the two anterior ones being direct, and those of the middle portion bent backwards and a little flattened on the summit: the lateral lobes marked by four or five ribs, which are distinctly grooved in the middle

and terminate in a scarcely marked furrow, beyond which is a thickened border.

SURFACE very minutely pustulose.

This species is distinguished by its wide semicircular head, very narrow groove, and wide border. The ribs in the lateral lobes of the pygidium are faintly developed, and sometimes obscure. The minute pustulose markings, when viewed under a lens, have their longest diameter transverse to the axis.

Geological formation and locality. In the Schoharie grit at Schoharie, and in the Helderberg mountains.

PROETUS ANGUSTIFRONS (n. s.).

The specimens of this species consist of a part of the head and the pygidium, which, from being associated in the same beds, and from similarity of surface-markings, I infer may belong to the same species. The glabella is moderately prominent, ovoid, the length and greatest width at base as six to five, and gradually narrowing from the base to the anterior end : the anterior furrow is narrow and not deep, with a wide flat border beyond. The occipital furrow is narrow, and the occipital ring wide and flat upon the top, and abruptly narrowed at each side, with low defined nodes. The pygidium is semicircular, very convex ; the axis prominent, broadly rounded, terminating abruptly behind, marked by ten rings ; the lateral lobes marked by six or seven ribs, which are longitudinally grooved : border wide, strongly striate on the lower side, and thick. Surface granulose.

This species differs from the preceding in the narrower and proportionally more elongate glabella ; the border is more flat, and the furrow more gently depressed ; the pygidium is stronger and more convex, and the posterior extremity of the axis more elevated.

Geological formation and locality. In the Schoharie grit : Schoharie.

PROETUS HESIONE (n. s.).

A single specimen of the pygidium, associated with the preceding species in the same rock, presents characters so unlike either of the others, that it must be at once recognized as distinct.

PYGIDIUM semielliptical, wider than long, length and breadth about as six to eight : axis prominent, a little compressed at the sides above the furrow, gradually tapering, marked by about thirteen or fourteen rings; those above and below being nearly direct, while those in the middle, rising vertically from the base, are bent backwards above the middle of the sides of the axis, and

make a slight retral curve on the summit. The lateral lobes are marked by nine ribs, which are deeply grooved along the middle, and more sharply marked in the east. The ribs terminate on the border in a distinct groove, the outer side of which is nearly flat; thence bending abruptly downwards, and a little spreading at the margin, making the border gently concave.

SURFACE unequally pustulose; the pustules on the ribs of the pygidium arranged in rows on each side of the groove, and distinctly marked in the east.

This species will be readily distinguished from the preceding by its form and the distinctness of the ribs in the lateral lobes, and more distinct groove along the centre, as well as stronger pustules.

Geological formation and locality. In the Sehoharie grit at Sehoharie.

PROETUS CLARUS (n. s.).

BODY very convex, elliptical; width two-thirds as great as length.

Head very convex, nearly semicircular; length a little greater than half the width; the anterior and sides limited by a border of moderate width with a narrow furrow, beyond which it is almost flat for more than half the width, then slopes suddenly to the margin. In the east the furrow becomes wider, and is limited by a narrow rounded ridge, beyond which the surface is concave to the outer margin. The border is prolonged posteriorly into spine-like processes, extending to about the fourth articulation. Glabella very prominent, round-ovoid; length equal to the width at base, gently narrowing and rounded in front : the occipital furrow narrow, with a strong occipital ring. Eyes prominent, two-thirds as high as long.*

In the thorax, the axis is prominent, semicircular in profile, the annulations direct : the lateral lobes are nearly flat for one-third their width, and then bend at an obtuse angle along the line of the geniculation of the ribs. Ribs sharply grooved a little anterior to the middle : the salient anterior portion of the rib rests against the posterior margin of the next anterior rib, which is distinctly bent backwards at this point.

The pygidium is semicircular; the axis very prominent, with nine or ten rings : the lateral lobes are a little flattened near the axis, and slope abruptly to the margin. Five or six ribs may be counted, which are marked by a shallow longitudinal groove, but are simple

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in the east : furrow of the limb very shallow, but much more distinct in the east; the lower side of the border marked by distinct concentric striae.

Surface granulose; the rings of the axis minutely pustulose.

The larger specimens of this species measure about one inch in length. It is distinguished from the *P. angustifrons* of the Schoharie grit by the more abruptly prominent axis, the angular lateral lobes, and more prominent ribs of the pygidium, as well as coarser surface-markings.

Geological formation and locality. In the upper limestone of the Upper Helderberg group : at Stafford, Batavia, and elsewhere in Genesee co. N.Y.

PROETUS CRASSIMARGINATUS

Calymene crassimarginata : HALL, Geol. Rep. Fourth District N.York, p. 172, f. 5.

Proetus crassimarginatus : HALL, Corrected List of Fossils, Twelfth Annual Report of Regents on the State Cabinet, p. 88.

Phillipsia crassimarginata : Cited by BILLINGS in the July number of the Canadian Journal, 1861, p. 362.

This species is chiefly known by the numerous pygidia which occur in many localities in New-York and elsewhere. The pygidium is remarkably convex or *bombé* : it has a length and breadth sometimes nearly equal ; but, when not distorted, it is wider than long. The axis is very prominent and rounded ; and in good specimens, sixteen or seventeen rings may be counted, and usually thirteen or fourteen. The annulations are not direct, but are inclined a little forward at their origin, and, at a point about halfway up the side, they bend a little backward so as to be vertical ; and again on each side of the summit there is an abrupt sinuosity, and a narrowing of the ring which, at the summit, is wider and direct. The sides of the axis present a very peculiar appearance, as if the lateral lobes were continued into the axis with the same advancing direction, and they terminate in acute points at a little more than one-third the height of the axis ; and into the interstices between these points the rings of the axis are inserted, making a little advancing curve, and a more abrupt retral curve before reaching the summit. The dorsal furrow is well defined, and the lateral lobes very convex. The ribs are twelve or thirteen in number, simple, terminating in a well-marked furrow ; beyond which there is a strong thickened border, which is concentrically striated on its outer margin and on the lower side.

In the east, the dorsal and marginal furrows are more strongly defined, and the thickened border is more prominent than when the crust is preserved. Surface finely granulose.

Two fragments of the head have been observed in the same association with these pygidia. One of these (from Williamsville, the most prolific locality of the species) has a very convex glabella one inch in length and seven-eighths of an inch in width at the base, narrowing but little towards

the front, which is obtusely rounded : the border in front of the glabella is deeply concave, and rises to the margin, which is thickened and striated.

Geological formation and locality. In the upper limestone of the Upper Helderberg group : at Williamsville and other places in Western New-York, in Canada West ; in Ohio, and at the Falls of the Ohio.

PROETUS CANALICULATUS (n. s.).

A fragment of this species, preserving the glabella, presents characters distinguishing it from any other in these rocks. The glabella is convex, ovoid, width and length about as five to six ; somewhat abruptly contracted opposite the anterior angles of the eye, and again a little spreading before curving to the anterior margin. The anterior glabella-furrow is short, and curves gently backwards : the second furrow begins at the anterior angle of the eye, is longer, and curves backwards ; while the third furrow originates opposite the centre of the eye, is nearly rectangular to the axis for a short distance, and then bends abruptly backwards, reaching nearly to the base of the glabella : at the centre of the base of the glabella there is a little prominence, and a slight depression on each side, while the posterior angles are subtruncate. Occipital furrow narrow, with an occipital ring of moderate strength. At the anterior margin of the glabella, the limb is marked by a sharp furrow, which is margined by a slight elevation ; beyond which it is regularly concave to a narrow ridge, and between this and the outer margin is a narrow even groove. Surface finely granulose.

The last-mentioned groove, the form of the glabella, and the peculiarity of the posterior glabellar furrow, are distinguishing features.

Geological formation and locality. In limestone of the age of the Upper Helderberg group : at the Falls of the Ohio.

PROETUS VERNEUILI (n. s.).

An entire specimen, which has the anterior part of the thorax and head crushed and distorted, presents peculiar and distinguishing characters in the pygidium. The glabella is small and very prominent ; the border is a little concave, and much extended in front. The thorax is comparatively small ; the axis very prominent, a little compressed on the sides : lateral lobes somewhat flattened near the axis, and curving abruptly downwards. Pygidium proportionally large, width nearly once and a half the length : axis prominent, a little compressed on the sides, marked by eleven rings, which are direct from the base, but bent backwards, and are a little thickened in the middle ; the second from the anterior margin, shows the base of a small spine : lateral lobes a little depressed at the dorsal furrow, and regularly convex beyond, marked by eight rounded ribs which are deeply sulcate be-
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tween. The ribs terminate in a shallow groove ; beyond which, and nearly in continuation, but bending a little backwards, elongate pustule-like nodes correspond in number to the ribs, with two more on each side posterior to the point where ribs can be counted, and a central one in a line with the pygidium, making ten on each side the central one : the anterior ones are longer and larger, and the posterior ones less conspicuous. Near the anterior margin, the border beyond these pustules is a narrow rim which increases in width anteriorly. Entire surface granulose or minutely papillose.

The pygidium is readily recognized by the ornamented border.

Geological formation and locality. In limestone of the age of the Upper Helderberg group : Williamsville, N.Y.

PROETUS HALDEMANI (n. s.).

ENTIRE BODY narrow, subelliptical, posterior end narrower; length $\frac{75}{100}$, and width at base of head $\frac{45}{100}$ of an inch. Head semicircular, with the posterior angles of the border produced : the groove in front is shallow and not strongly defined, the border beyond thicker and rounded; the facial suture, in its anterior extension, bends outwards to a line beyond the longitudinal centre of the eye, and, from this point in the furrow, bends forward to the margin of the limb. Glabella ovate, distinctly contracted opposite the anterior angles of the eyes; length a little greater than the greatest width : lateral lobes marked by furrows all directed obliquely backwards; the third one cutting off the posterior angle, and scarcely reaching the base. The occipital furrow is narrow, and the occipital ring a little stronger than the rings of the thorax.

THORAX neatly defined; axis prominent, the annulations of the lower half directed a little forwards in the middle : lateral lobes flat as far as the geniculation of the ribs, and then bent abruptly downwards in a nearly straight line, the extremities of the articulations curving a little forward.

PYGIDIUM neatly symmetrical, semioval, the length and width as five to seven; axis moderately elevated, gradually tapering, marked by twelve or more articulations, the middle ones of which are slightly undulated : lateral lobes gently convex for half their width and sloping a little abruptly at the sides, with about twelve ribs on each side, terminating in a shallow furrow and surrounded by a plain thickened border. Two or three of the anterior ribs of the pygidium extend across the furrow, and are perceptible in the

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thickened border. About half the ribs are distinctly divided towards their extremities, and a faint groove is perceptible along the whole length of several of the anterior ones. The crust is all preserved except on the greater part of the glabella, and though somewhat worn (from much handling), appears to have been finely granulose or papillose, the worn surfaces a little punctate. The edges of the border, both of head and pygidium, are striate.

This neat and beautiful species was presented to me many years since by Professor S. S. HALDEMAN, of Columbus, Pa. The specimen is from Pennsylvania, probably from rocks of the age of the Hamilton group. At this time I have before me the pygidia of several specimens from the Goniatite limestone, near the base of the Hamilton group, which are specifically undistinguishable from this one; having the same number of ribs and proportions essentially the same, not differing more from the typical form than may result from pressure and other causes. The surface of one specimen is somewhat rougher; and in one, the groove of the ribs is more strongly marked.

In the body and head, this species is readily distinguished from the others here described: in the separated pygidia, the axis is less prominent and more pointed below.

Geological formation and locality. In limestone of the age of the Hamilton group? Pennsylvania; and in the Goniatite limestone, Manlius and Cherry-valley, N.Y.

PROETUS ROWI.

alymene rowi: GREEN, Amer. Journal of Science and Arts, Vol. xxxiii, p. 406.

This Trilobite was first noticed by Mr. LE Row, in the Poughkeepsie Telegraph, Nov. 22, 1837; and described by Prof. GREEN in the following year, as cited. Several years since, I obtained the loan of the original specimen from Mr. LE Row, and had a cast taken in plaster, and a drawing made: the plaster cast measures a little more than one inch and a half. I have a mould in stone of a specimen from Otsego county, which measures nearly the same as the former.

The entire head is ovate; the breadth at base of buckler is one inch, and, at the anterior margin of the pygidium, three-fourths of an inch. The head and body are remarkably convex; the glabella-extremity prominent, ovate; the length half an inch, and the greatest width between the eyes a little more than four-fifths of an inch, somewhat contracted just opposite the anterior angles of the eyes. The glabella-furrows are indistinctly shown in the mould in stone, and in another imperfect specimen; and the posterior one has apparently produced a slight indentation at the base. The eyes are very prominent, and much below the plane of the summit of the glabella.
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The border is wide, but the details cannot be made out. The posterior angles are produced in spines, which reach as far as the fourth (and perhaps the fifth) articulation of the thorax.

The thorax has the middle lobe very large and extremely convex, its width in the middle being greater than the width of the lateral lobe; gradually tapering from the anterior, and almost pointed at the posterior extremity in the pygidium : dorsal furrow strongly marked, with a slight depression of the lateral lobes towards the furrow, thence a little flattened and regularly curving downwards to the margin.

The pygidium is very convex, twice as wide as long and nearly semicircular, being a little narrowed below the middle ; the axis prominent, conical, marked by ten or twelve* rings, which are vertical or ascending near the base, and a little bent backwards near the top and sides : lateral lobes marked by seven or eight ribs, some of which are marked by a longitudinal groove a little above the centre. Surface granulose.

This species is readily distinguished by the ovate form, great convexity, prominent glabella and robust axis, which, from being wider than the lateral lobes at its anterior extremity, tapers nearly to a point in the pygidium.

Geological formation and locality. In the coarse sandy shales of the Hamilton group : at Fly creek and other places in Otsego county ; and in the coarser shales and conglomerate beds of the same group in Schoharie county, N.Y.

PROETUS MARGINALIS.

Calymene marginalis [?] : CONRAD, Ann. Rep. Palaeontology N.York, 1839, p. 66.

“ *C. MARGINALIS.* Buckler with a broad margin : eyes large, semi-oval; middle lobe entire, convex, smooth; abdomen”

“ *Locality,* near Ithaca, in a boulder. This has a much less prominent front than the [*C.*] *rowi*, a deeper groove between the eye and middle lobe ; and the tubercle, which nearly joins the lower angle of the eye, is much smaller.”

The boulder alluded to is a large mass of the Tully limestone many miles south of the outcrop of that rock ; and from this circumstance, I am induced to regard the PROETUS of this rock as the fossil described by Mr. CONRAD.

The entire form of the body is oval-ovate ; the length about once and a half as great as the width. The head is margined by a wide border, which is produced into short posterior spines. The groove in front of the eye is narrow and well defined, becoming broader on the cheeks. Beyond the groove the border is at first convex, thence sloping abruptly and spreading in a

* Ten can be counted, and there is space for two more; but I have no specimen which clearly shows the full number

wide gently concave surface. The glabella is ovoid, very convex; the length a little greater than the width at base. The anterior and middle glabellar furrows are not conspicuous, but appear as gently curving lines, and originating near the anterior angle of the eye. The posterior furrow causes a slight indentation, and, curving backwards, reaches nearly to the posterior margin (all the furrows being visible in the cast). The occipital furrow is narrow; the occipital ring of medium width, and narrowing so as to become obsolete near the dorsal furrow; the nodes of moderate size and prominence.

In well-preserved specimens the thorax is about once and a half as wide as long, the axis and lateral lobes being nearly equal in width; while in flattened specimens, the axis is wider than the lateral lobe. Axis rounded and prominent; the lateral lobes flat for nearly half their width, and not depressed at the dorsal furrow. (Other specimens, from compression, have an apparently wider axis and a depression along the dorsal furrow.) The pygidium is semioval, two-thirds as long as wide: axis prominent, and marked by nine or ten rings; the lateral lobes with seven ribs, which are grooved along the centre, and terminate in a narrow convex border. Surface granulose.

This species, when compared with the *P. rowi*, shows the distinctions pointed out by Mr. CONRAD of the less prominent glabella and smaller occipital nodes. Compared with the *P. clarus* of the Corniferous limestone, there are few conspicuous differences; the most important, as far as observed, being in the form and extension of the border of the head. This species, however, is separated by one thousand feet of deposits, in which no similar form of PROETUS is known to occur.

Geological formation and locality. In the Tully limestone, near Ovid in Seneca county, N.Y. Collected by JOHN CHAMBERS.

PROETUS MACROCEPHALUS (n. s.).

ENTIRE BODY elongate oval-ovate; the head, thorax and pygidium nearly equal to each other in length. Head large, somewhat semi-circular, with the border produced behind in short sharp spines; the anterior portion of the border marked by a semicircular groove in advance of the glabella; the margin thickened and recurved, marked on its upper, lower and lateral faces by sharp parallel elevated striæ or ridges which are separated by regular rounded grooves. Glabella prominent, ovate; width and length about as five to six: anterior and middle furrows distinct; and the posterior one, extending almost directly inwards from a point a little posterior to the middle of the eye, turns abruptly and extends to the posterior margin, leaving a large ovate distinctly

separated posterior lobe. The eyes are very prominent (when well preserved) : the facial suture, as far as can be ascertained, extends in an almost straight line from the eye to the frontal margin.

The hypostoma is ovate and very convex. The thorax forms a parallelogram, the width being nearly twice the length, and but slightly diminishing posteriorly : the axis strong, elevated, nearly semicylindrical; the dorsal furrow strongly marked, and the lateral lobes flattened or a little concave on their inner side, and bending abruptly towards the margins. The furrow in the ribs is almost linear, and the anterior limb is scarcely curved on its margin.

The pygidium is about equal in length to the head, semielliptical; the axis prominent, elongate-conical, marked by thirteen or fourteen rings, which are thickened at the base and rise vertically, bending a little backwards on the upper part of the sides, making a curve which extends over the summit : the rings are somewhat thickened at the summit, and may have been nodose or spinose. Lateral lobes depressed towards the dorsal suture, flattened or moderately convex in the middle and sinking abruptly at the sides, marked by about eleven ribs which are scarcely (or not at all) grooved. The border is broadly concave, the outer edge a little recurved.

SURFACE of the head marked by small pustule-like papillæ, which are inclined backwards; the thorax and pygidium marked by sharp pustulose points, which are sometimes arranged in rows upon the articulations. The crest of the axis appears to have been nodulose or spinose; but of numerous specimens examined, none are quite perfect in these parts.

A separated cheek shows the eye to have been extremely elevated.

This species has a well-marked expression, differing from all the others described. The large glabella and distinct separation of the elongate posterior lobe are very characteristic. The specimens examined consist of three nearly entire individuals, and about eleven of the pygidia.

Geological formation and locality. In the shales of the Hamilton group: Geneseo, Moscow, Pavilion, and Canandaigua and Skeneateles lakes, N.Y.

PROETUS MACROCEPHALUS, var. a.

A specimen nearly entire, and several pygidia, present some variation from the strict characters given of the preceding. The pygidia are semi-circular, twice as wide as long; the rings of the axis distinctly nodose on the summit, and the little pustulose markings of the ribs on the lateral lobes are arranged in two rows.

There are four specimens exhibiting the form of pygidium and character of surface indicated; and another, with a semicircular pygidium, has the ribs angular.

Geological formation and locality. In the shales of the Hamilton group: at Moseow and Bloomfield; and in a stratum of limestone in the Hamilton group, at Eighteen-mile creek on Lake Erie.

PROETUS AURICULATUS (n. s.).

GLABELLA round-ovate, the length equal to the greatest breadth across the posterior lobes: anterior to the furrows, the breadth is one-fifth less; the measurements being five-eighths, and half an inch. The anterior and middle furrows are gently curved; the posterior one more oblique, and deeply separating the short ovoid posterior lobe from the body of the glabella. The occipital furrow is strongly defined: the border is deeply depressed immediately in front of the glabella, rising abruptly beyond, and again depressed in a narrow groove, with the margin recurved.

In the same association there has been found a pygidium with a very prominent rounded axis, terminating abruptly behind, and marked by nine or ten direct rings; and the lateral lobes by seven or eight ribs (the posterior ones being obscure, as are the rings of the axis), terminating in a wide spreading border. The glabella is distinguished by its very convex form, the equal length and breadth, and the distinct separation of the posterior lobes. The axis of the pygidium is proportionally broader and stronger than in any other species described in this paper.

This species very nearly resembles the *Proetus missouriensis* of SHUMARD (Geological Report of Missouri, pa. 196, pl. B, f. 13 a, b); but the glabella is proportionally longer. There is a less degree of similarity in the pygidium of that species, and the one found associated with the glabella of this species.

Geological formation and locality. In shaly sandstones of the age of the Chemung group: in Licking county, Ohio.

PROETUS OCCIDENS (n.s.).

THE PYGIDIUM is semielliptical, having a length of three-fourths of an inch by a width of nearly one inch ; the axis of moderate elevation, rounded and tapering to a narrow extremity, marked by ten or more rings : dorsal furrow not strongly defined; the lateral lobes sloping gently from the furrow for two-thirds their width, and beyond this more abruptly; marked by nine or ten flattened ribs, beyond which the markings are obscure.

SURFACE finely granulose.

This species, in proportions of the pygidium, resembles some of the flattened specimens of *P. macrocephalus*; but the rings of the axis and ribs of the lateral lobes are fewer, and are not pustulose. It is very distinct from any species described in this paper.

Geological formation and locality. In the shaly limestone of the age of the Hamilton group : at New-Buffalo, Iowa.

PROETUS LONGICAUDUS (n.s.).

ENTIRE BODY elongate-ovate, gradually tapering in a curved line to the posterior extremity. Head broadly semielliptical, very convex in the transverse direction ; the limb wide and thick, gently depressed in front of the glabella, and sloping to the margin; posteriorly the border has been produced into angular or spiniform extensions. The glabella is ovate, slightly contracted and nearly straight for a little distance in advance of the eyes, and then abruptly rounded in front; extremely convex between the eyes, and somewhat abruptly sloping towards the front. The anterior furrow curves gently from the anterior angle of the palpebral lobe, and reaches halfway to the centre of the glabella : the middle furrow rises from nearly opposite the anterior fourth of the eye, and is a little longer than the anterior furrow; the posterior furrow rises from opposite the middle of the eye, and curves gently backwards, coming out on the base of the glabella so that the two divide its width into three nearly equal parts. The occipital furrow is narrow and sharply defined; the occipital ring a little stronger than the body rings, and flattened at the dorsal furrow, but without nodes. Eyes neatly defined, prominent and semioval.

THE THORAX is short, with parallel sides and a prominent semi-

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cylindric axis marked by nine annulations : lateral lobes nearly flat for half their width; the ribs sharply grooved; the anterior limb angular on the margin.

THE PYGIDIUM is remarkably elongate, having a length and width almost precisely equal : the axis prominent; section semielliptical, the height being more than half the width, and very gradually tapering to an obtuse point; marked by twenty-two annulations which are vertical on the sides, but a little bent forwards on the summit of the axis. Lateral lobes flat near the axis, thence curving gently to near the middle of the width, and bending more abruptly downwards; marked by twelve ribs, and terminating in a broad sloping border which is abruptly turned upwards at the margin. SURFACE finely granulose.

This species is remarkable in having but nine articulations of the thorax, in the extreme elongation of the pygidium, and the number of rings in the axis. The glabella is more prominent between the eyes, than in any species which I have seen. In all these respects, and in the absence of nodes at the base of the occipital ring, it differs so greatly as to afford few points of similarity with any of the species described in this paper.

Geological formation and locality. This species, together with a PHACOPS undistinguishable from *P. bufo*, var. *rana*, were given to me by Rev. Mr. NASH of Desmoines, Iowa; who informed me that they were from some point far to the northeast of that place, the particular locality having been lost or forgotten. The region indicated is occupied by a broad belt of the Hamilton group, and I presume this species to be from rocks of that age.

GENUS LICHAS (DALMAN).

LICHAS ARMATUS (n. s.).

In the collections from Western New-York, there are several fragments of a species of LICHAS, in many respects similar to *L. pustulosus*, and also to *L. biggsyi*. The pygidium is rounded to the limits of the border on the lower side, making very nearly a semi-circle, the centre being at the anterior margin of the axis. The axis is marked by three indistinct rings on the upper half; and in the middle it becomes very gibbous and surmounted by a strong spine, the other portions of the surface nodose. The lateral lobes are deeply grooved; the anterior limb marked by small nodes, and the posterior limb by a row of strong elevated nodes with intermediate smaller ones.

A portion of a head, obtained from limestone of the same age in another locality, resembles the head of *L. bigsbyi*. The median lobe is very gibbous, rising almost vertically in front, somewhat abruptly narrowed and depressed behind, separated by a distinct furrow from the anterior and middle lobes : anterior lobe gibbous, oblong, wider behind than before, without distinct limitation between it and the middle lobes. Occipital furrow strongly marked, with a wider occipital ring : palpebral lobe small. Eye almost semicylindrical. Entire surface pustulose : pustules of unequal size.

The anterior lobe of the glabella is less abruptly gibbous in front, and more gradually tapering behind, than in the other species : the form of the lateral lobes is also distinctive, and the pustules on the surface more elevated and unequal.

Geological formation and locality. The pygidia are from the upper member of the Upper Helderberg group at Williamsville, and the head from the same position in Schoharie county, N.Y.

LICHAS GRANDIS (n.s.).

A remarkable fragment, which appears to be the posterior part of the head of a LICHAS, preserves the base of the anterior lobe of the glabella, which is narrowed and depressed between the lateral lobes, and spreads a little towards the occipital furrow. The lateral lobes are large, broad and strongly elevated, the summits surmounted by elongate nodes, with smaller nodes or tubercles upon other parts of the surface. The occipital furrow is of moderate width and depth; the occipital ring wide and strong, the anterior portion with numerous small tubercles, and the posterior portion ornamented by four strong elevated clavate nodes.

This fragment agrees perfectly with LICHAS in the disposition of the parts of the head preserved, viz. the remains of an anterior lobe and two lateral lobes, with a strong occipital ring. The specimen is more than three inches in diameter ; and from the occipital ring to the broken anterior margin, it is two and a half inches.

Geological formation and locality. In the Schoharie grit : Schoharie.

GENUS ACIDASPIS (MURCHISON).

Some fragments of trilobites have been found in the Schoharie grit, which may belong to this genus. Up to this time, however, the specimens obtained are too imperfect and unsatisfactory for description.

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GENUS BEYRICHIA (M'Coy).

BEYRICHIA PUNCTULIFERA (n. s.).

CARAPACE valves minute, semioval, almost equilateral, the anterior end very slightly narrower, convex and abruptly bending downwards to the dorsal margin; marginal rim well developed, and sharply elevated on the ventral and lateral margins. The surface, at the more prominent part above the centre, and just at the bending towards the dorsal margin, is marked by two very prominent nodes, which are nearly equidistant from the margins and from each other. The entire surface is punctate with minute rounded pits.

This species is scarcely more than the twentieth of an inch in height; but it is distinguished by the minutely punctured surface and very prominent dorsal nodes.

Geological formation and locality. In the shales of the Hamilton group: in Ontario county, N.Y.

GENUS LEPERDITIA (Rouoult).

LEPERDITIA CAYUGA (n. s.).

VALVES strongly convex, subovate, length about once and a half the width, subtruncate at the anterior end; ventral margin somewhat abruptly curved, the greatest width a little posterior to the middle. The left valve is apparently thickened towards the ventral margin; but the specimens are in such a condition as to afford no satisfactory evidence of the surface-markings.

Geological formation and locality. In the Corniferous limestone : at Blanding's quarry, Springport, near Cayuga lake, N.Y.

LEPERDITIA SPINULIFERA (n. s.).

MINUTE, ovoid, length less than one-sixteenth of an inch. Valves most convex and a little gibbous towards the posterior end. Anterior tubercle strongly developed, and close to the dorso-lateral angle; the antero-central portion a little depressed, with a very minute and scarcely defined tubercle : the posterior end is obliquely subtruncate and very obtuse; the posterior dorso-lateral angle marked by a distinct node, and the posterior ventro-lateral

angle has a distinct spine projecting obliquely beyond the margin. The hinge-line is canaliculate on the back, and the margins of the valves project in a thin sharp line along their junction at the ends, and less conspicuously on the ventral side.

SURFACE marked by distinct undulating striae.

This species has all the external marks of *LEPERDITIA*; and the striae, or impressions of the vessels radiating from the central tubercle, are very distinct under a lens.

This shell is slightly smaller than *L. punctulifera* of the same rocks.

LEPERDITIA SENECA (n. s.).

In the same shale with *L. spinulifera* are several specimens of a short ovoid form of *LEPERDITIA*, which is essentially smooth, and for the most part the individuals are smaller. A larger specimen of apparently this species, where the crust is removed, shows an indentation on the centre of the valve. An impression of another individual has the appearance of having been made by a granulose surface.

Of the three species known in the Hamilton group, the *L. punctulifera* is far the most abundant.

Geological formation and locality. In the shales of the Hamilton group: Ontario county, N.Y.

ANNELIDA.

GENUS SPIRORBIS (LAMARCK).

SPIRORBIS ANGULATUS (n. s.)

DISCOID or very slightly ascending, making two or more volutions: outer volution robust; the transverse diameter greater than the dorso-ventral, and the sides sometimes subangular. Surface lamellose striate, the lamellæ undulating and sometimes crowded into ridges, and the upper angular side sometimes nodose. The aperture is rounded or oval, and usually nearly rectangular to the plane of volution, but sometimes turned upwards.

This species is usually attached to shells, and particularly to *TROPIDO-LEPTUS*. It is a more robust species than the *S. laxus*, and less distinctly annulated.

Geological formation and locality. In the shales of the Hamilton group: at Darien in Erie county, and in Ontario county, N.Y.

NOTE.

THE TRILOBITES enumerated and described in the preceding pages include all those satisfactorily known to me at this date, from the Upper Helderberg, Hamilton and Chemung groups, with the exception of the following species which was omitted in the proper place.

HOMALONOTUS DEKAYI (GREEN, sp.).

Dipleura dekayi : GREEN, Monograph, p. 79.

Nuttainia sparsa : EATON, Geological Textbook.

Homalonotus dekayi : VANUXEM, Report of the Third Geological District, p. 150.

— — : HALL, Report of the Fourth Geological District, p. 205.

This species is known in the Hamilton group from near the Hudson river to Lake Erie; but is comparatively rare on the west of Cayuga lake, and extremely rare to the west of the Genesee valley.

The *Phacops nupera* (*Calymene nupera*, Report 4th Geol. District of New-York), from the Chemung group, may probably be only a variety of *Phacops rana*, though its condition is such as not to admit of critical comparisons.

I have had no opportunity for investigating the following species, described by Mr. CONRAD in the Annual Report on the Palæontology of New-York for 1841, p. 48, from the Schoharie grit and Onondaga limestone.

“ *ASAPHUS? ACANTHOLEURUS*. Pygidium very wide at base ; margin “ lunate, but projecting in the middle. A broad space between the ends “ of the ribs and the margin, on which are nine thick erect spines, the “ central one largest. Surface of the lobes with coarse tubercles. *Loca- “ lity* : Near Schoharie, in limestone with *ODONTOCEPHALUS* (Onondaga “ limestone), found by Mr. GERHARD jr.”

“ *A.? DENTICULATUS*. Pygidium with a lunate margin, denticulate at the “ termination of the ribs : ribs simple, with two rows of minute tu- “ bercles on each. *Locality* : Schoharie, in Grit N° 18. Found by Mr. “ GEBHARD.”

A wax cast, from an impression of the first of these species, shows a character of pygidium not unlike that of *Dalmania myrmecophorus*. Both species doubtless belong to the Genus *DALMANIA*.

SUPPLEMENTARY NOTE TO THE THIRTEENTH REPORT
OF THE REGENTS ON THE STATE CABINET.

IN the Thirteenth Annual Report of the Regents upon the State Cabinet, I published a notice of the Trilobites of the Quebec group, occurring at Georgia (Vermont), proposing the generic names *BATHYNOTUS* and *BARRANDIA* for the two generic forms. At the moment of sending the manuscript to press, I had changed the generic name *OLENELLUS*, at first proposed, to *BARRANDIA*, in honor of the author of the "*Système Silurien de Bohême*"; unfortunately overlooking the fact that Prof. M'Coy had proposed the same name for a genus of trilobites. As the later name is untenable, even if the genus proposed by M'Coy should be abandoned, I shall propose to return to the name *OLENELLUS*; retaining the views originally expressed as to the relations with *PARADOXIDES* and *OLENUS*, the primordial types to which the new genus is allied.

PRELIMINARY NOTICE
OF SOME OF THE SPECIES OF CRINOIDEA KNOWN IN THE
UPPER HELDERBERG AND HAMILTON GROUPS OF NEW-YORK.

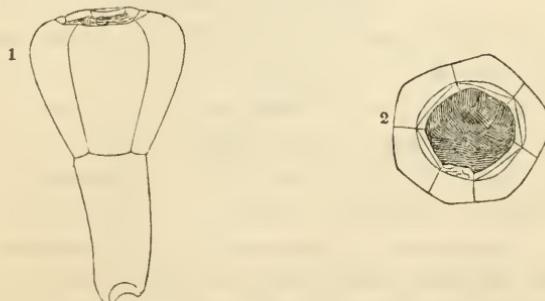
CRINOIDEA.

GENUS EDRIOCRINUS (HALL).

IN the third volume of the Palæontology of New-York*, I have proposed the name EDRIOCRINUS for some species of Crinoidea which are apparently destitute of a column, but which in their young state are affixed by their basal plates, and afterwards become free. One of the described species, in its earlier stages of growth, often occurs in groups of two or three individuals, firmly adhering to some foreign body by a broad base of attachment.

The species described are from the Lower Helderberg limestones and from the Oriskany sandstone.

In the limestone of the Upper Helderberg group there is a similar form, with more elongated base, which is sometimes rounded, and resembles a short column; but so far as I am able to determine from the specimens examined, the species is sessile, having the structure of those already described, without a jointed column.



1. Figure of a specimen, natural size, showing base and first radial plates.
2. View of the summit of the specimen.

* Palæontology, Vol. iii, p. 119.

EDRIOCRINUS PYRIFORMIS (n. s.).

GENERAL form elongato-pyriform or subclavate. Base elongate, subcylindrical, more or less attenuate, solid, or the plates closely anchylosed. Radial plates more rapidly expanding, giving a short turbinated aspect to the upper part of the body, contracting towards their superior margins, which are more or less abruptly bent inwards; the upper margins marked by two narrow grooves, for the insertion of the next series of plates.

SURFACE smooth or finely granulose-striate.

The specimens which I have examined are about an inch and a half in length, from the base to the summit of the radial plates. One specimen preserves a fragment of a single plate of the third series, but too imperfect to be of any value in determining the form. The base is usually concave: as if, in the living state, adhering to and clasping some cylindrical body.

Geological formation and locality. In the limestone of the Upper Helderberg group. Collected by E. JEWETT and C. A. WHITE, from Eastman's quarry south of Utica.

GENUS CHEIROCRINUS (HALL).

Thirteenth Annual Report of the Regents of the University, on the State Cabinet of Natural History.

CHEIROCRINUS CLARUS (n. s.).

BODY of medium size and strength, a little flattened on the dorsal side below, and expanding slightly above. Column short, flexuous: joints in the lower part long, becoming shorter above; basal plate short, concave. First dorsal plate triangular, short, the base a little concave in the centre and straight on each side: dorso-lateral plates five-sided, large, a little thickened at the junction of the arm-plates; upper dorsal or dorso-radial plate short, five-sided, and supporting a single simple arm which is composed of rounded or subcylindrical plates about once and a half as long as wide. The second plate above the dorso-lateral plate is cuneate above, and supports two arms; while the lower plate of the ventral arm is likewise bifurcating, and sustains on its ventral slope a third arm; giving three lateral arms, each of which bifurcate several times, and all are composed of elongate cylindrical joints. [Other arms may exist on the ventral side, but they are not visible in the specimen examined.]

SURFACE finely papillose.

The specimen is essentially entire : the column is attached by a spreading root to the column of another crinoid. The column of the *CHEIROCRINUS* is about two and a half inches in length; while the length of the body and arms, when fully extended, has been about the same. From the position of the animal and the direction of its column, it appears to have been attached to the crinoid column while that body remained in a vertical position, or while the animal to which it belonged was in a living state. This seems the more probable, since, had it been attached to a fragment lying on the bottom, the pendant arms of the Cheirocrinus would have reached nearly or quite to the muddy sediment.

Geological formation and locality. In the shales of the Hamilton group: Ontario county.

GENUS ANCYROCRINUS (n. g.), HALL.

In the shales of the Hamilton group, and in the limestone of the Upper Helderberg group, there occur numerous crinoidal bodies, which, at one extremity, have the form of a bulb or thickened column, with lateral ascending processes and a central ascending column of greater or less length.

Specimens of this character, in what appear to be incipient stages of growth, are like fragments of crinoidal columns, rounded and sometimes attenuated below, with a small articulating scar at the extremity : recognizing this as the base, there proceed from the sides obliquely ascending spine-like processes, of the character of a crinoidal column, but tapering to an obtuse point, or sometimes truncate. The central portion continues above these divisions, and is marked by the transverse joints, while the part below and the lateral processes are rarely thus marked.

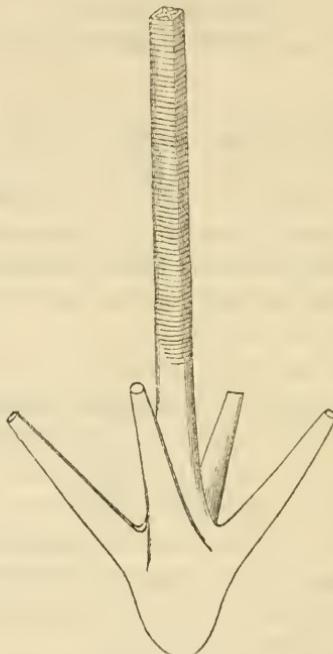
As the development progresses, this lower portion, and the part around and above the lateral processes, becomes enlarged and swollen in the form of a bulb. The central column above sometimes continues till the bulb acquires a comparatively large size; but often it separates, and the cicatrix becomes more or less obliterated and covered by calcareous accretion which sometimes assumes a concentric lamellose structure.

In the more perfect specimens the form is somewhat biturbinate, the base rounded and larger than the portion above the processes. In some of the forms the lateral processes are all nearly or quite in the same range, while in others they are unequal, and often one of them is considerably above the others at its origin.

No structure has been determined in these parts; and thus far we do not know the body, which we infer has been attached to the

summit of the column. The column is round in its lower part, sometimes becoming quadrangular above, and is unequal in its dimensions.

These bodies seem to have been the base, and indicate the existence of a free floating crinoid, with the thickened bulb below serving as a balance for the column and body above. The articulating scar on the lower extremity of the smaller ones indicates that the animal was fixed in its young state.



For these bodies and their appendages, a designation is required; and I have chosen that of *ANCYROCRINUS*, indicating the anchor-like appendage of the column.

ARCYROCRINUS BULBOSUS (n. s.).

BULBIFORM below, with four lateral, obliquely ascending processes of the character of jointed or solid spines, which are more or less thickened according to age. Column above the bulb often elongated, rounded in the lower part and obtusely quadrangular above in older specimens, which preserve but a small part of the column as a thickened process. Body and arms unknown.

The figure is from a specimen in the State Collection, which preserves about seven inches of the column above the bulb. The lateral processes are restored from another specimen.

Geological position and locality. In the shales of the Hamilton group : Lake Erie shore, and elsewhere.

ANCYROCRINUS SPINOSUS (n. s.).

BODY biturbinate, smaller above; lower part rounded, swelling and sometimes ventricose. Lateral processes four, arranged at regular intervals and at nearly equal height from the base. The central portion above the lateral processes more or less elevated, rounded, and, in the young forms, extremely conical; the summit marked by a scar, but no column has been seen attached.

Geological formation and locality. Limestone of the Upper Helderberg group : Falls of the Ohio, and elsewhere.

GENUS PLATYCRINUS (MILLER).

PLATYCRINUS ERIENSIS (n. s.).

BODY small, cup-shaped : cicatrix for the attachment of column comparatively large, bordered by a thickened rim. Basal plates closely anchylosed, curving gently upwards : radial plates a little wider than high, and the suture marked by a sharp line. The centres of the plates become prominent above the middle, and terminate in a conspicuous articulation which occupies nearly one-third the width of the plate. First arm-joint quadrangular; the second pentagonal, giving a bifurcating arm : arm-joints strong, subangular, thickened at their extremities, and supporting on the upper angles strong jointed tentacula. Surface granulose.

This neat little species is scarcely more than three-sixteenths of an inch from the base to the origin of the arms, while the arms themselves have been more than three times as long. The strong subangular joints of the arms, and the strong tentacula, are marked characters.

Geological formation and locality. In the shales of the Hamilton group: near Hamburg, Erie county, N.Y. Collected by C. A. WHITE, 1860.

PLATYCRINUS EBORACEUS (n. s.).

BASE large, spreading, consisting of three distinct plates, the suture lines marked by a narrow ridge : cicatrix for column attachment of moderate size, prominent, and very distinctly serrated on the edge. Entire surface finely granulose.

The width of the basal plates altogether is nearly an inch, while the elevation is only about three-fourths of an inch.

Geological formation and locality. In the shales of the Hamilton group: near York, Livingston county. Collected by C. A. WHITE and R. P. WHITFIELD, 1860.

GENUS POTERIOCRINUS (MILLER).

POTERIOCRINUS NASSA (n. s.).

BODY turbinate : base comparatively broad, pentangular, with the column-scar strongly marked, and its angles corresponding to the sutures of the plates. Basal plates pentagonal, longer than wide, the lateral angles at the base a little prominent, corresponding to the form of the column : subradial plates hexagonal (except on the anal side) and subequal, nearly once and a half as long as wide; radial plates shorter than their width, hexagonal (except on the anal side), broadly truncate above, with the margin thickened for the attachment of the strong arm-plates. The subradial plates are prominent and subangular along the middle, and somewhat abruptly depressed at the sides.

SURFACE smooth or finely granulose.

Geological formation and locality. In the shales of the Hamilton group, near Canandaigua, N.Y. Collected by R. P. WHITFIELD, 1858.

POTERIOCRINUS NYCTEUS (n. s.).

BODY turbinate : height and greatest width nearly equal. Basal plates a little longer than wide : subradial plates about one-fourth longer than wide : radial plates nearly twice as wide as long, prominent above, the upper margin thickened and projecting; a little depressed between the centre and the lateral margins, the latter slightly thickened at the suture line.

ARMS bifurcating on the third joint from the base, composed of rounded joints which are once and a half as long as wide, contracted in the middle and swelling at the extremities : every second joint on the opposite sides give origin to armlets of similar character to the arms. The tentacula undetermined. Proboscis nearly three times as long as the body plates.

PLATES on the anal side comparatively large, supporting on the upper margins the plates of one side of the strong elongate proboscis, hexagonal, wider than high, and gradually diminishing in size from the base. Upper anal plate, and plates of the proboscis, marked by radiating subangular ridges towards the margin. Plates of the body and arms striato-granulose, the striæ arranged in a radiating direction.

COLUMN round, comparatively strong; the upper part composed of joints of unequal length, in a somewhat regularly alternating

order; and below this, of nearly equal joints which are about half as long as wide, with strongly crenulate margins.

Geological formation and locality. In the shales of the Hamilton group, Ontario county, N.Y. C. A. WHITE, collector.

POTERIOCRINUS DIFFUSUS (n. s.).

BODY small, turbinate. Basal plates small, about as long as wide : subradial plates less than one-fourth longer than wide, prominent in the middle : radial plates short, much wider than high, the upper margins thickened and projecting. Three plates are visible in the anal area, the lower one of which is subpentagonal, the two lower sides resting on adjacent subradial plates. The three lower arm-plates are wider than long.

ARMS bifurcating on the third plate, giving ten arms, which are long and slender, widely diverging, composed of long cylindrical joints curving alternately on opposite sides, and giving a zigzag direction to the arms. Every second or third joint gives off armlets, which are composed of joints similar to those of the arms, but proportionally longer : intermediate joints shorter than those bearing the armlets. No tentacula proper have yet been observed.

SURFACE of the body granulose. Column round; the upper part consisting of thicker and thinner joints, with the edges rounded.

Geological formation and locality. In the shales of the Hamilton group, Ontario county, N.Y. C. A. WHITE, collector.

POTERIOCRINUS NEREUS (n. s.).

BODY small, subpentagonally turbinate. Basal plates short, minute, forming a narrow rim about the base of the body : subradial plates longer than wide : radial plates shorter than the subradials, thickened at the upper margins. First arm-joint short; second one much longer, and thickened at the extremities. Arms bifurcating on the second joint from the radial plate; the joints nearly twice as long as wide, rounded and thickened at the extremities, and giving origin to slender jointed tentacula. Surface granulose or granulose-striate, sometimes apparently smooth.

COLUMN obtusely subpentangular near the base of the body, and composed of joints of unequal thickness.

Geological formation and locality. In the shales of the Hamilton group, Ontario county, N.Y. Collector C. A. WHITE.

POTERIOCRINUS VERTICILLUS (n. s.).

BODY elongate, clavate or subfusiform; the height to the top of the first radial plates equal to twice the greatest transverse diameter. Basal plates elongate, about twice as high as wide, gradually expanding from below; their upper ends obtusely pointed. Subradials half as high again as wide, three hexagonal and two heptagonal. First radials half as large as the subradials, a little wider than high, pentagonal and hexagonal. Second radials, or first arm-plates, small, little more than half as wide as the first radials, quadrangular. Four anal plates are preserved in the specimen; the first small, quadrangular, resting obliquely upon two subradials, and its upper margins placed against the lower lateral angles of a first radial and the second anal plate: second and third anal larger, resting between the first radials of the adjacent rays; fourth one small, about equal to the second radials, and resting directly on the top of the third anal plate. Arms unknown.

SURFACE of plates smooth or finely granulose. Column round, of medium size, composed of rather strong plates, which are somewhat unequal near the junction with the body.

This species is closely related to *P. fusiformis* of the Burlington limestone, in general form and structure, but differs in the proportions of the plates, especially of the first arm-plates, which in that species are very long.

Geological formation and locality. In the shales of the Hamilton group: Ontario county. C. A. WHITE, collector.

POTERIOCRINUS INDENTUS (n. s.).

BODY less than medium size, broadly calyculate or subturbinate, gradually spreading to the top of the first radials. Basal plates low, less than one-fourth of the entire height of the cup, very obtusely pointed at the upper end. Subradials proportionally large, height and breadth subequal; three hexagonal and two heptagonal, the latter largest. First radials of moderate size, a little wider than high, pentagonal, with the upper angles bent inward, giving them the appearance of being heptagonal. Cicatrix for the arm-attachment extending two-thirds across the plate. Four anal plates preserved; the first one is largest, pentagonal, resting between two subradials and the first radial plates: second anal plate smaller, resting on the top of the largest subradial; third and fourth anal plates small.

SURFACE marked by strong indentations at each angle of the plates, giving an elevated appearance to the space on the border of the plate between the angles, forming ridges which join across the sutures of the plates. Column long, proportionally strong, composed of very unequal plates alternating with each other.

Geological formation and locality. In the shales of the Hamilton group: Ontario county. C. A. WHITE, collector.

CYATHOCRINUS (SUBGENUS ?).

CYATHOCRINUS BULBOSUS (n. s.).

BODY small, nearly hemispherical, forming a bulb-like projection at the base of the strong expanded arms. Basal plates minute: subradials of moderate size, four hexagonal, one heptagonal. First radials larger than the subradials, broad, short, pentagonal. Anal plate elongate, quadrangular. Arms spreading horizontally from the body, proportionally strong and massive, composed of short broad plates with outer margins slightly elevated. In some rays the first bifurcation is upon the third plate, in others at greater distances, and varying in different specimens: in one specimen, it occurs on the eleventh plate of one ray. Above the first, there are generally about three other bifurcations in the main division, and the branches divide at irregular distances, giving ten to fifteen branches to each ray.

THE terminal plates of the outer divisions are thin, and obtusely pointed. The lateral diameter of the arm-plates is about double that from the outer to the inner faces. Inner face of the arms strongly grooved. The scars for the attachment of tentacula have not been observed.

THE body is proportionally very small, the arms spreading an inch and a half on each side. The column (if any) has been extremely small, as no cicatrix for its attachment has been observed. The arms in all the specimens are expanded, and this appears to have been the normal condition.

The structure of the body, being identical with that of CYATHOCRINUS, offers no means of separation from that genus; but the strong expanding and broadly grooved arms are unlike any of its known species.

Geological formation and locality. In the limestone of the Upper Helderberg group : Livingston county, N.Y.

GENUS FORBESIOCRINUS (DE KONINCK).

FORBESIOCRINUS LOBATUS (n. s.).

BODY less than the medium size of the genus, spreading somewhat abruptly from the base to the third radial plates, from which the arms rise almost vertically. Basal plates small and short, forming a narrow ring around the base : subradial plates short, pointed above ; rays prominent : radial plates abruptly bent inward at the sides, the upper margins deeply sinuate for the reception of the patelliform plate of the next superior joint; the third radial marked by a prominent central node near its upper margin. Interradial spaces deeply depressed, with numerous interradial plates. Arms bifurcating on the third radial plate, and again two or three times above this. Surface finely granulose.

The length of the body and arms (which are incurved at the summit) is a little more than one inch.

This species bears considerable resemblance, in general form and proportions, to the *F. giddingsi* of the Carboniferous limestone.

Geological formation and locality. In the shales of the Hamilton group, Ontario county, N.Y. C. A. WHITE, collector.

FORBESIOCRINUS NUNTIUS (n. s.).

BODY pentalobate below, subturbinate, regularly spreading from the base to the free arms. Basal and subradial plates rudimentary, the latter barely visible beyond the column-facet. The primary radial series consists of three plates, which increase rapidly in width from the lower one : interradial and anal plates apparently none. Secondary radial series three, decreasing in width from below upwards; the last one a bifurcating plate. On one ray the arm bifurcates on the fourth plate, while the other division is simple to the sixth plate, the seventh being apparently a bifurcating plate.

SURFACE strongly granulose or papillose, with a median ridge on the centre of the plates, and a strong, short, obtuse, ascending spine at the centre of the bifurcating plate.

The upper part of the column is round, enlarging upwards, and composed of thin joints so characteristic of the genus. The marks of the overlapping patelliform plates are well preserved in the rays.

The close resemblance between this species and the *O. thiemei* of the Burlington limestone is very remarkable. It differs in the character of surface and in the divisions of the ray, which are regularly bifurcated

three or more times, while in the *O. thiemei* there are no true bifurcations above the second one. The specimen is imperfect in its upper part.

Geological formation and locality. In the shales of the Hamilton group, associated with *Platycrinus eriensis*, *Spirifer granuliferus*, *S. mucronatus*, *Strophodonta demissa*, *Orthis penelope*, and other characteristic Hamilton fossils : Erie county, N.Y. C. A. WHITE, collector.

GENUS RHODOCRINUS (MILLER).

[SUBGENUS] ACANTHOCRINUS? (RÆMER).

Admitting the formula of *RHODOCRINUS* as now generally adopted among authors, which recognizes five basal plates instead of three as given by MILLER, the genus will include several forms heretofore referred to other genera. The formula given by DE KONINCK is as follows :

Basal plates, 5;
Subradials, 5;
Radials, 3×5 ;
Brachials, 1 or 2, soldered to or forming part of the calyx;
Interradials, 6 to 8×4 ;
Anal s, 10 to 12;
Interaxillaries, 1×5 ;
Arms 10 to 20, bifurcating two or three times.

Adopting this formula without other restrictions, we include those forms with five rudimentary or undeveloped plates, as *THYSANOCRINUS* and *LYRCOCRINUS* of the Niagara group, as well as *OLLACRINUS*, *GILBERTOCRINUS* and *ACANTHOCRINUS*, where the basal plates are developed.

In the simpler forms of *RHODOCRINUS*, we have the three radial plates, succeeded by one or two pairs of secondary radials or brachial plates below the arm openings; with arms in pairs, with or without bifurcations; and a simple interradial series of six or eight plates, uniting with those of the rounded dome.

These forms, which are usually globose or subglobose, begin their existence in the Lower Silurian strata, and continue through intermediate formations to the Carboniferous limestone.

In *THYSANOCRINUS* we find a departure from those just noticed, which include some of the typical forms of the genus. The described forms of *THYSANOCRINUS* are not globose, but turbinate; the basal plates rudimentary; the arms usually bifurcating from their origin; the interradial plates usually three, with a single axillary or interbrachial plate. The character of the dome is not well determined :

in some, there seems reason to infer the existence of an elongate proboscis.

In *LYRIOCRINUS* we have a subglobose body, with the basal plates extremely rudimentary, and not noticed in the original generic description, though since proved to exist. The interradial plates are four or five, with a single interbrachial plate; the arms rising in pairs from each ray, and continuing simple to their extremities. Dome unknown.

In *ACANTHOCRINUS*, the basal plates are developed beyond the column; the subradials and first radials bear nodes or spines. The rays divide on the third radial, and each division has three suprرادials below the free arm-plates. In the typical species of this genus by RÖEMER, there are shown about fifteen interradial plates and several interbrachial plates.

In the Hamilton group we have at least two species, which, preserving the formula of *RHODOCRINUS*, have nevertheless an unusual form for species of that genus, and approach the *ACANTHOCRINUS* in some of the more important features. I have therefore referred them, for the present at least, to that genus or subgenus of *RHODOCRINUS*. In the same association we find a single globose form of *RHODOCRINUS*, with the arms in pairs surrounding the low dome.

RHODOCRINUS (ACANTHOCRINUS) NODULOSUS (n. s.).

BODY short, turbinate : height and greatest width about equal. Basal plates pentangular, well developed, and separating the subradial plates from the column-area. First radial plates pentagonal, or sometimes with one of the lower angles truncate, giving an irregular hexagonal form. Second radials hexagonal, wider than high. Third radials pentagonal, or sometimes unequally hexagonal. The rays bifurcate, and have three or four simple plates in each of the secondary radial series; above which, they become a double series of pentagonal arm-plates. Arms bifurcating, becoming free at the fifth, sixth, or seventh range of plates above the suprرادial series, and again bifurcating a second and a third (and perhaps a fourth) time; the bifurcations widely divergent. If the rays are equal, the entire animal had at least forty arms.

INTERRADIAL series consisting of fifteen or more plates, the first one much larger than either of the others. Interbrachial series consisting of about twelve plates. Column, at the base of the body, large and round, with a pentangular cavity.

SURFACE of the subradial and first interradial plates distinctly no-

dose in the middle, with obsolete ridges radiating to the margins of the plates : radial plates elevated but not nodose in the centre, and with the radiating ridges well defined towards the margins. Interradial plates (above the first one) and interbrachial plates strongly nodose.

This species has the aspect of one of the larger forms of *FORBESIocrinus*; the height from the base to the first division of the ray being nearly one inch, and thence to the second bifurcation nearly three-fourths of an inch.

Geological formation and locality. In the shales of the Hamilton group: Ontario county, N.Y. C. A. WHITE, collector.

RHODOCRINUS (ACANTHOCRINUS) GRACILIS (n. s.).

BODY small, turbinate : rays prominent; base small, pentalobate, as is the upper part of the column. Basal plates small, but distinctly developed beyond the column-facet : subradial plates small; first radial plates comparatively large; second and third radials a little smaller; second radials two or three, below the first bifurcation of the arms. One division of the ray bifurcates once, the other twice; giving five arms from a single ray. Arms simple, slender, composed (near the base) of a single series of plates which are wider on one side, but finally composed of a double series of wedgeform plates. Interradial plates small, subnodose or tuberculate, about twelve or more visible in each series. Interbrachial or interaxillary plates minute, undetermined.

This species likewise bears a resemblance to *FORBESIocrinus* in the prominence of the rays, and in the numerous small plates of the interradial areas. The arms bifurcate only near the base; and in this respect, it differs conspicuously from the preceding species.

Geological formation and locality. In the shales of the Hamilton group: Ontario county. C. A. WHITE, collector.

RHODOCRINUS SPINOSUS (n. s.).

BODY subglobose : height and breadth about as two to three; base concave; basal plates covered by the column. Subradial plates large, the lower half bending abruptly into the basal depression : first radial plates comparatively large, heptagonal; second and third radials smaller, the third one a bifurcating plate which gives origin to two simple arms.

INTERRADIAL series consisting of seven or more plates; the first one large and hexagonal, sustaining three smaller ones. Interbrachial series of one or more plates. The subradial, first radial, and first interradial plates large and convex, with a strong spine proceeding

from the centre of each one. The spines from the radial and interradial plates are as long as the height of the body : the spines of the subradial plates of similar character.

THE second and third radials are marked by a longitudinal ridge, which bifurcates on the upper plate. The interradial plates are marked by central ridges, with defined ridges extending to the margins of the plate. The first radial and first interradial plates are broadly undulating; the elevated parts extending from the sides of the plate, and the depressions towards the angles. Arms elongate, subcylindrical, composed of short joints which are narrowly grooved on the inner side, and furnished with jointed tentacula.

This little species is most remarkable in the strong elongate spines, which are much more extreme than in any species heretofore observed.

Geological formation and locality. In the shales of the Hamilton group: Ontario county. C. A. WHITE, collector.

GENUS TREMATOCRINUS (HALL).

TREMATOCRINUS SPINIGERUS (n. s.).

BODY small, urnshaped, inflated in the lower part, constricted above the middle and again spreading at the top, forming a rim-like expansion at the base of the arms. Summit concave : base impressed; the cavity embracing the basal and subradial plates. First radial plates large, forming the base of the cup : plates of the antero-lateral and postero-lateral rays uniting with each other by the lateral edges; the others separated by the first interradial and first anal plates of the corresponding areas, which truncate and rest upon the subradials. Second radials but little smaller than the first, hexagonal. Third radials smaller than the second, heptagonal; the upper cuneate edge supporting the superradials, from the second of which rise the true arms : these are long and slender, rounded on the back, and in the lower part consisting of short plates, bifurcating on the fifth plate; above this, they are composed of short cuneiform plates, arranged like those of true *POTERIocrinus*.

INTERRADIAL spaces occupied by fifteen or sixteen small plates, and enclosed at the top by the summit-arms, which are proportionally strong in the lower part and composed of a double series of semi-elliptical plates to the fourth pair, where they bifurcate, forming a pair of slender cylindrical processes. The entire length of these arms is about one-fourth greater than the height of the whole body.

ANAL area larger than the interradial, and occupied by a greater number of plates; not limited above by a single summit-arm like those, but opening to the dome, and having a more slender summit arm arising from each side: these arms are composed of four ranges of small plates, the range on the lower side largest. This arrangement gives six summit-arms, instead of five as in the other species of this genus.

SURFACE of plates finely granulose.

THE first and second radials bear on their centres long spines. The plates of the radial series are elevated above the arms, giving (in a basal view) a pentalobate form to the body. Summit composed of numerous very small plates, and ornamented by several lozenge shaped depressions as in the typical forms of the genus.

The lateral or true arms, in this species, present some differences of structure and mode of attachment from those observed in one of the typical species of the genus. The arm-plates originate on the second suprарradial, and are alternately wider on one side. Each arm bifurcates on the fifth plate above its origin, and continues undivided as far as the eighth plate above this, having the character of the arms of *CYATHOCRINUS* or *POTERIOCRINUS*; while those observed in the Carboniferous species appear like slender and pendulous tentacula. Better specimens of the latter, however, are required to determine these characters in detail.

Geological formation and locality. Shales of the Hamilton group : Ontario county. C. A. WHITE, collector.

GENUS ACTINOCRINUS (MILLER).

ACTINOCRINUS NYSSA (n. s.).

CALYX hemispherical, with a tripartite rim surrounding the base, formed by the projection of the lower margin of the basal plates. Column-cicatrix of moderate size, scarcely depressed. First radial plates of medium size, the upper and lower lateral faces subequal. Second radials a little smaller than the first, somewhat regularly hexagonal. Third radials smaller than the second, heptagonal, supporting still smaller hexagonal suprарradials on the upper margins: these again support a brachial plate, with a single arm on the outer face and a secondary suprарradial on the inner face: this again supports a brachial and single arm on the inner face, and a series of three suprарradials of the third order on the outer face, the upper one of these supporting an arm on each side; giving four arms to each main division of the ray, or eight arms to each ray = 40 arms.

ARMS long and slender, composed of a double series of very narrow short plates, interlocking on the back of the arm (which is there slightly grooved) and angular on the edges. Each plate gives support to a series of slender jointed tentacula, with a node or short spine on the outer surface of each joint.

INTERRADIAL spaces occupied by five, seven or more plates; the first equal in size to the second radials, hexagonal, and supporting two in the second series : two or three plates in the third and fourth series. Intersuprرادials two or three between the main divisions of the ray. Anal area much larger than the interradial area, and occupied by a greater number of plates in ranges of 1, 3, 9, 5, respectively; above which, they are irregularly placed.

SURFACE of plates marked by a single set of rounded ridges, forming pointed nodes in the centres; those traversing the radial series the stronger and more elevated. Dome elevated; the plates bearing a spine upon the centre of each.

Geological formation and locality. In the shales of the Hamilton group: Western New-York. C. A. WHITE, collector.

ACTINOCRINUS EUCHARIS (n.s.).

CALYX somewhat larger than the medium size, broadly turbinate, a little inflated in the lower part, with a thin trilobed rim at the base of the cup, formed by the lower margin of the basal plates. Basal plates low : first radials rather large, with large superior lateral margins; second radials much smaller, hexagonal; third radials less than two-thirds as large as the second, pentangular, supporting on each of the upper sloping edges a primary suprارadial of nearly equal size. These, on their outer sides, support a series of three brachials, and on the inner a secondary suprارadial: this supports brachials on each of its upper faces, giving six divisions to each ray before the arms become free; while the central branch of each main division again bifurcates after becoming free, giving a formula of

$$\frac{8}{\frac{8}{8}} = 40 \text{ arms.}$$

INTERRADIAL spaces large, occupied by ten or eleven plates each; the first one equal in size to the second radial, hexagonal, and supporting two smaller plates in the second range, one hexagonal and one heptagonal, with three in the third range, two in the fourth and fifth, and sometimes a small plate above. Intersuprارادials three or more between the main divisions of the ray.

ANAL area much larger than the interradial area, and occupied by

a greater number of plates : the first one equals in size the first radial, and supports three in the second range, with five in the third range; above which, the arrangement cannot be well determined.

SURFACE of plates marked by radiating ridges, which form, with those from adjoining plates, a series of isosceles triangles : in the lower part of the cup they are a triple series, and in the upper part a single series. The ridges which traverse the ray are stronger, and form a sharp carina, with strong nodes on the second radial plates; while on the centres of all the other plates are low angular nodes.

This species differs from *A. nyssa* in the form of the cup, in the surface characters, and in the divisions of the rays, which take place lower down in the calyx. It bears considerable resemblance to *A. tenuis* of DE Koninck (*Monograph*, pa. 128, pl. ii, f. 3).

Geological formation and locality. In the shales of the Hamilton group: Western New-York. C. A. WHITE, collector.

ACTINOCRINUS PRÆCURSOR (n. s.).

BODY small, short, subglobose, truncate at the base. Basal plates small, depressed below for the reception of the column. First radial plates proportionally large, much wider than high. Second radials less than half the size of the first, quadrangular. Third radials very small, subtriangular, with the lateral angles scarcely truncate; the upper sloping margins supporting an arm on one side, and on the other two supraradials, the upper one of which supports two arms; giving three arms to each ray.

INTERRADIAL areas consisting of three plates each ; the first of moderate size, supporting two small ones in the second range, above which the plates more properly belong to the dome. Anal plates ten or more; the first little more than half as large as the first radial plates, supporting three in the second series and five in the third, with small plates above, uniting with those of the dome. Arms strong, composed of a double series of short plates, each of which has an elevated ridge in the middle, giving a very rugose structure to the arm.

SURFACE of body-plates elevated, and roughened by confluent granulæ. The dome is imbedded in rock, and not determined.

This species is of the type of *A. unicornis* of the Burlington limestone (Carboniferous), and strongly resembles it in the calyx and arms; differing in some details of structure, and in surface characters.

Geological formation and locality. In the shales of the Hamilton group: Western New-York. C. A. WHITE, collector.

ACTINOCRINUS CAULICULUS (n. s.).

BODY small. Calyx broadly cupshaped, approaching hemispherical, with a thin projecting rim around the base; somewhat pentalobate in a basal view, from the protrusion of the arm-bases and plates of the radial series. Basal plates of moderate size, low, projecting at the lateral margins. First radial plates proportionally large, wider than high. Second radials small, pentagonal or hexagonal, as wide as high. Third radials a little larger than the second, pentagonal or heptagonal, supporting on each upper sloping edge two suprرادials plates of moderate size, one above the other : the upper one of these is a bifurcating plate, and gives origin to two arms, making four arms to each ray = 20 arms.

INTERRADIAL plates three in each series ; the first one hexagonal, wider than high, supporting two smaller plates in the second range : above this, they are more properly dome-plates. First anal plate nearly equal in size to the first radial, heptagonal, supporting three small plates in the second range, with a still larger number in the third range.

ARMS becoming free above the third radial plate; composed in the lower part of cuneate plates, and, above, of a double series of interlocking plates, their length a little less than the breadth of the arm, and their surfaces beautifully ornamented by granules and small curving ridges.

SURFACE of plates marked by a single set of low, rounded, radiating ridges, which unite with those of the adjoining plates at the sutures, and, meeting in the centres of the plates, they form rounded or angular nodes.

This species differs from either of the preceding in the structure and number of the arms. In the arrangement of the calyx-plates, it is closely related to *A. nyssa*; but it is a smaller species, and differs in the number of the arms.

The four preceding species are remarkably similar to Carboniferous forms of the genus; and, aside from their well authenticated geological associations, would in themselves offer no means of separation from the Crinoidea of the Carboniferous fauna.

Geological formation and locality. In shales of the Hamilton group: Western New-York. C. A. WHITE, collector.

ACTINOCRINUS CALYPSO (n. s.).

BODY of medium size, somewhat narrowly turbinate to the bases of the free arms. Basal plates proportionally large, with a somewhat small column-facet. First radial plates of moderate size, with upper and lower lateral margins subequal. Second radials about half as large as the first, hexagonal. Third radials much smaller, pentagonal, the upper lateral angles slightly truncated; the upper sloping sides each supporting a series of two small suprарradian plates : from the upper one of these rise two arms in the anterior and antero-lateral rays, giving four arms to each of these rays. The postero-lateral rays are probably the same, which would give an arm-formula of

$$\frac{4}{4-4} = 20 \text{ arms.}$$

FIRST interradial plate intermediate in size to the first and second radials, hexagonal; supporting two smaller hexagonal or heptagonal plates in the second range, with a larger number of very small plates above, meeting with those of the dome. Anal area not determined.

ARMS round, slender, twice or twice and a half as long as the height of the cup, composed of a double series of very short interlocking plates, each of which bears a long tentacle composed of very long joints.

SURFACE of plates marked by low, distinct, rounded, radiating ridges, from one to four at each margin, most numerous at the base and decreasing upwards. A strong rounded ridge commences at the upper margin of the first radial plate, and extends through the middle of the ray to the base of the free arms, where it equals them in size, and is longitudinally marked by granulose striæ.

This species differs from *A. caulinodus* in the surface markings; while the arm-formula, as well as the arm-structure, appear to be alike in both: it also differs from that species in the form and relative height of the basal plates.

Geological formation and locality. In the shales of the Hamilton group: in Western New-York.

ACTINOCRINUS POCILLUM (n.s.).

Body regularly hemispherical below the arms. Base with a comparatively large depression for the column-attachment, and a low rounded tripartite rim formed by the thickening of the basal plates. First radial plates of moderate size, wider than high. Second radials much wider than high, hexagonal. Third radials smaller than the second, broadly pentagonal or heptagonal; supporting on each upper sloping face, in the anterior and postero-lateral rays, a single suprرادial plate, which gives origin to an arm on each side, making four arms to each of these rays. In the antero-lateral rays, those plates support an arm on each side, giving only two arms. This makes a brachial formula,

$$\frac{\frac{4}{2}}{\frac{2}{2}} = 16 \text{ arms.}$$

FIRST interradial plate large, hexagonal; supporting two smaller plates in the second range, with still smaller ones in the third, uniting with the dome-plates. First anal plate smaller than the first radials, heptagonal; supporting three smaller plates in the second range, five in the third, and still more in the fourth, the plates in each series smaller than in the preceding one. Arms round, slender, with two bifurcations, composed of two series of short plates interlocking on the back; the upper edges elevated, producing a somewhat imbricate appearance, with granulose surface.

SURFACE of plates marked by four small lozenge-shaped elevations, covered by very fine radiating striae. These raised portions of the surface occupy a triangular space on each side of the sutures between adjacent plates, so that there are as many of these elevations surrounding each plate as there are sides to the plate : the centres of the plates are also slightly elevated.

Geological formation and locality. In the shales of the Hamilton group: Western New-York. C. A. WHITE, collector.

ACTINOCRINUS : SUBGENUS MEGISTOCRINUS (OWEN).

MEGISTOCRINUS DEPRESSUS (n.s.).

Body rather large, broadly spreading, shallow. Dome depressed, with strong deep constrictions or depressed areas between the rays and their divisions, reaching to the centre, which is ornamented with a strong spine : five other spines are at the junction of the ridge, marking the divisions of each ray, about halfway from the centre

to the periphery, making six in all. A somewhat strongly elevated aperture is situated in the depression corresponding with the anal series. Basal plates small, extending but little beyond the cicatrix of the column. First and second radial plates about equal in size, the latter regularly hexagonal. Third radials smaller, heptagonal; supporting on each upper sloping face (in the anterior and postero-lateral rays) a hexagonal or heptagonal suprرادial plate, with brachials on each of its upper faces, giving four arm-bases to each of these rays; while in the antero-lateral rays they support the brachials, giving only two arms : this makes the formula,

$$\frac{\frac{4}{2} \cdot \frac{2}{2}}{\frac{2}{4} \cdot \frac{2}{4}} = 16 \text{ arms.}$$

INTERRADIAL series consisting of eight to ten medium-sized plates and three to five smaller ones, which unite with those of the dome : the first is largest and hexagonal, supporting two hexagonal plates in the second range, three in the third range (one of which is hexagonal and two pentagonal), two in the fourth range of unsymmetrical form, and above this the smaller ones irregularly placed.

ANAL area much larger than the interradial area, composed of twenty plates (more or less), the first about equal to the first radials, and supporting three in the second range; above this, irregularly arranged. In the four-armed rays, there are about three interbrachial plates; and in the two-armed rays, one plate. Arm-bases spreading in compressed lobes around the margin of the cup formed by the interbrachial constriction of the dome. Dome composed of numerous polygonal plates, which are much smaller than the body-plates.

SURFACE of body-plates marked by fine radiating striae. In old specimens, the plates of the lower part of the calyx are thickened just within the margins.

This species differs from others in the deep constriction of the summit, and in the strong spines; while its extremely depressed form is likewise characteristic.

Geological formation and locality. In the shales of the Hamilton group: Western New-York. C. A. WHITE, collector.

MEGISTOCRINUS ONTARIO (n. s.).

BODY rather large, broad cupshaped. Dome depressed-convex, with a small subcentral proboscis situated a little nearer the anal side; composed of numerous small polygonal plates, which are raised in low rounded ridges, commencing about midway between the proboscis and the margin and extending to the inner side of the arm-bases, one to each division of the ray, becoming stronger towards the margin. These ridges are ornamented by small spines, of which there are three to the anterior ray and each of the postero-lateral rays, and one to each of the antero-lateral rays, and a central one just anterior to the proboscis.

BASE flattened : basal plates small, barely extending beyond the circumference of the column. Plates of the primary radial series subequal or slightly diminishing in size from below upwards, somewhat elongate; the third one supporting supraradials on each upper face, with brachials on each of the upper sloping faces in the anterior and postero-lateral rays; while in the antero-lateral rays, they sustain brachials, giving only two arms to each of these rays and four to each of the others, making an arm-formula

$$\frac{4}{4} \frac{4}{4} = 16 \text{ arms.}$$

INTERRADIAL spaces consisting of eighteen or twenty plates each : there are from one to three small interbrachial plates between each division of the rays. Anal plates numerous, from thirty-five to forty : the first nearly as large as the first radial plates, sustaining three smaller ones in the second range and five in the third; above which, they are not so regularly arranged.

SURFACE of plates marked by fine radiating confluent striae, which give a beautiful sculpturing to the centres. The plates of the calyx are depressed.

ARMS at their base strong, composed of a double series of interlocking plates. Column round, strong, with very unequal joints.

This species differs from the preceding in the greater depth of the calyx, the more elevated and less deeply grooved dome, and in the more numerous and smaller spines. It also possesses a subcentral proboscis, instead of only a prominent anal aperture. The sculpturing of the plates is of a different character, and the surface of the plate depressed with prominent margins almost the reverse of *M. depressus*.

Geological formation and locality. In the shales of the Hamilton group: Western New-York. C. A. WHITE, collector.

GENUS CACABOCRINUS (TROOST, Catalogue).

DOLATOCRINUS? (LYON).

THE generic formula of this genus, according to the typical species of the author, is as follows :

Basal plates, 3;

Radials, 5×3 ;

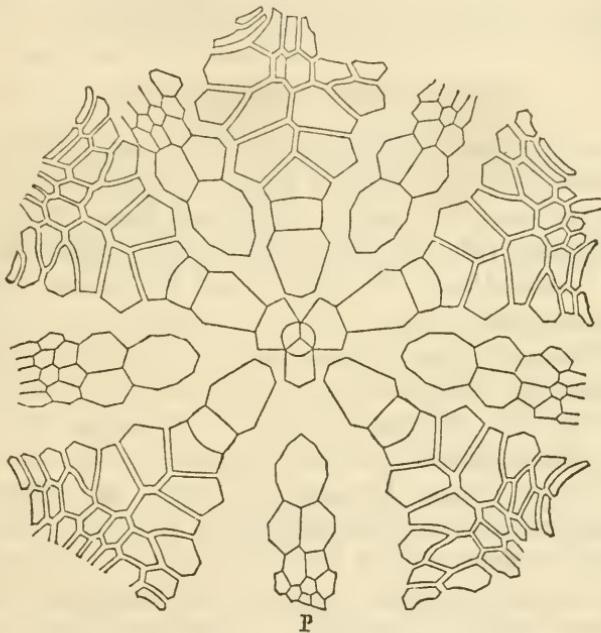
Radials of the second series, or supraradials, 10×1 or 2;

Interradials, 1 to 10 or more.

Anal area not distinguishable from the interradial areas.

CACABOCRINUS (Diagram of the typical species).

a



CACABOCRINUS SPECIOSUS (n. s.).

BODY of medium size, oblate or depressed-spheroidal, with strongly protruding arm-bases. Dome moderately elevated, with a short obtusely pointed spine, at the base of which is a somewhat large anal aperture. Basal plates small, entirely concealed within the basal depression. First radial plates large, the inner margins bending into the basal depression. Second radials much smaller, quadrangular, a little wider than high. Third radials wider than the second, short, pentagonal; supporting upon each sloping side a series of three plates, one above the other : upon the upper of these, rest the first arm-plates.

INTERRADIAL series consisting of three or four plates arranged one above the other : the first very large, heptagonal; the second pentagonal or hexagonal; the third and fourth small; the upper one is placed between the arm-bases. Dome-plates numerous, variable in size and form.

ARMS two from each ray, unknown except near the base.

SURFACE of plates not rising above the general convexity of the body, except a strong sharp carina or ridge which traverses each ray from the edge of the basal depression to the base of the free arms, bifurcating on the third radial plate : this carina is strongest at its origin and on the second radial plate.

Geological formation and locality. In the limestone of the Upper Helderberg group : Schoharie, and elsewhere in New-York.

CACABOCRINUS TROOSTI (n. s.).

BODY of medium size. Calyx subhemispherical, moderately depressed at the base. Basal plates a little more in diameter than twice that of the column. First radials wider than high. Second radials quadrangular, twice as wide as high. Third radials short and broad, pentangular, a little larger than the second; supporting upon each upper edge a series of two supraradials; the upper one wedgeform above, and giving origin to an arm on each side.

FIRST interradial plate equal to or larger than the first radial, ten- or eleven-sided, irregularly subovate; supporting two or three small elongate plates above, which are followed by another range of still smaller plates between the arms of the adjacent rays. Intersupraradials, one between the main divisions of the ray.

ARMS long, slender, round on the back, composed of a single series of joints which are about once and a half as wide as high. Each plate bears upon the lateral edges long slender jointed tentacula. The arms are four from each ray at their origin, bifurcating twice and sometimes three times above.

From the middle of the first radial plate to the origin of the free arms, the plates of this series are traversed by an abruptly elevated rounded ridge. The surface of all the calyx-plates marked by radiating and parallel lines of granulæ. Longitudinal confluent striæ mark the arms in well-preserved specimens.

This species differs from the preceding in the form of body, in the surface markings, and in having the basal plates external to the column-facet.

Geological formation and locality. In the shales of the Hamilton group: Western New-York. C. A. WHITE, collector.

CACABOCRINUS LIRATUS (n. s.).

BODY large, oblate or depressed-spheroidal, somewhat lobed at the top of the calyx, and on the summit by the arm-bases : base flattened. Basal plates depressed for the column-facet, which is about one-half their diameter; the depression bounded by an elevated rounded rim. First radial plates large. Second radials about half as large as the first, broad, quadrangular. Third radials about equal to or a little smaller than the second, much wider than high, pentangular; supporting upon each upper margin two large suprرادial plates, one above the other : upon the upper one rests the first arm-plate.

INTERRADIAL series consisting of two or more plates; the first one very large, somewhat elongate, nine-sided ; the second resting upon the first, irregular, wider below, and reaching to the centre of the arm-bases : sometimes there is an irregular plate on one or both sides of this second interradial, between it and the second suprادرال. Dome moderately convex, strongly lobed; the lobes corresponding with the rays, composed of rather large plates, some of them subspinose, with a subcentral proboscis of medium strength.

SURFACE of calyx-plates marked by several parallel sets of strong elevated striæ, the longest radiating from the centre, where they form a low angular node : they unite with those from adjoining plates, crossing the sutures at right angles. On different parts, these sets vary from two to five or six. A stronger ridge passes along the centre of each ray, rising from the edge of the central depression of the basal plates, bifurcating on the third radial, and extending to the arm-bases.

ARMS two from each ray at their origin, with strong bases, composed of a double series of short interlocking plates.

Geological formation and locality. In the shales of the Hamilton group: at several localities in Western New-York. C. A. WHITE, collector.

CACABOCRINUS LIRATUS, var. MULTILIRA.

THIS form is similar to the preceding, but more oblate, with more spreading cup and proportionally larger column : the depression in the basal plates is less, and the surface-markings more evenly developed and more numerous, having from three or four to nine striæ on each face of the plate, and the small triangular areas within the sets marked by distinct granules. The ridges traversing

the centres of the plates of the rays are proportionally less developed.

In single individuals, this form, when compared with the preceding, might be regarded as a distinct species.

Geological formation and locality. In the shales of the Hamilton group: Western New-York. C. A. WHITE, collector.

CACABOCRINUS GLYPTUS (n. s.).

BODY large, very depressed-spheroidal. Dome elevated and terminating in a subcentral process, strongly lobed at the arm-bases. Base flattened : basal plates of medium size, mostly covered by a large column. First radial plates large, much wider than high. Second radials quadrangular, little more than half as high as the first, twice as wide as high. Third radials pentangular, a little longer than the second, once and a half as wide as the greatest height; supporting upon each upper margin a series of two suprرادials, the first twice as large as the second, which supports the first arm-plates.

FIRST interradial plate large, subcircular, nine-sided, supporting one hexagonal plate less than half as large as the first radial : three plates in the third series, the central one uniting with the dome-plates, and the two smaller plates resting partly upon the lateral margins of the second interradial, and partly upon the lateral margins of the first suprرادials; these aid in supporting the second suprرادials and first arm-plates.

ARMS two from each ray at their origin, the bases strong and protruding.

SURFACE of calyx plates marked by interrupted lines of nodes, principally radiating from the centre to the angles. A sharp carina passes along the centre of each ray from the basal plates to the arm-bases, rising in angular nodes on the centre of each plate : sutures channelled.

This species differs from the preceding in the proportions of the plates: the first interradials are shorter, the arm-bases somewhat longer and more protruding; while the surface is marked by a few lines of nodes from the centres of the plates to the angles, instead of numerous and continued striae passing at right angles to the faces.

Geological formation and locality. In the shales of the Hamilton group: near Pavilion, Genesee county.

CACABOCRINUS GLYPTUS? var. INTERMEDIUS.

THIS form has the general proportions and structure of *C. glyptus*, but with a more elevated dome (many of the dome-plates with a distinct node on the centre), and more deeply lobed between the rays. In surface characters, the lines are only from two to four in number, crossing the different margins of the plates; while on some of the centres they form nodes, with several smaller surrounding nodes. The ridge marking the radial series is but little developed in the lower part, but strongly in the upper, rising in nodes on the centres of the plates : those of the third radials are prominent, and triangular in form.

Regarding these variations as too marked to unite this form with the preceding species, I have designated it as a variety, possessing characters intermediate to *C. liratus* and *C. glyptus*.

Geological formation and locality. In the shales of the Hamilton group: Livingston county. C. A. WHITE, collector.

CACABOCRINUS LAMELLOSUS (n. s.).

BODY large, broad, spreading horizontally to the top of the third radial plates. Basal depression for the column-attachment large, deep, subcircular, embracing the basal and lower third of the first radial plates. First radials large, broad near the upper end; upper lateral margins short. Second radials short, broad, quadrangular. Third radials larger than the second, broad, pentangular; the upper margins long, supporting nearly as large suprرادials. These are cuneate above, and support on each upper side a series of two secondary suprرادials, which are much smaller : upon the upper of these rests the first arm-plate. This gives four arms to each ray, making at the arm-bases a formula of

$$\frac{4}{4} - \frac{4}{4} = 20 \text{ arms.}$$

FIRST interradial plate the largest in the whole body, ten or eleven-sided, resting between the plates of the adjacent radial series as high as the suprرادials, and sometimes the secondary suprرادials plates. The second interradial plate is small, pentangular, with parallel sides : the third interradial plates are two, resting on the second. In one of these spaces (which may perhaps indicate an anal area), the second suprرادials do not rest upon the first interradial plate, and there are two elongate plates in the second range, with two or more small plates above in the third range.

SURFACE marked by numerous slender radiating striæ, which, in

some specimens, form erect lamellæ by their greater elevation : also the plates of the radial series are marked by a strong central ridge which forms subangular or lanceolate nodes on the first and second radial plates, becoming obsolete on the third radial and first suprرادials; while the second suprارadial plates are elevated into a broad angular ridge.

This species bears considerable resemblance to *C. sculptus*, in general form and surface markings; but in structure and number of arms, it is very unlike.

Geological formation and locality. In the limestone of the Upper Helderberg group : Western New-York.

THE Devonian genera of Crinoidea, CERAMOCRINUS and EPACTOCRINUS of MULLER, and MYRTILLOCRINUS of SANDBERGER, possess some characters in common, which render it difficult, with the descriptions and illustrations within my reach, to determine the relations of these genera, or the range of characters which may be admitted under the several designations. Desirous of avoiding the multiplication of synonyms, I have placed the following species under the Genus MYRTILLOCRINUS, until we are able to ascertain more fully its entire characters.

GENUS MYRTILLOCRINUS (SANDBERGER).

MYRTILLOCRINUS? AMERICANUS (n. s.).

BODY small, broadly ovoid, largest at the upper end. Base truncated by the attachment of a proportionally large column, which has a quadrangular foramen. Basal plates five, very small, forming a low ring around the top of the column. Subradial plates five, alternating with the basals, hexagonal, but with the lower margins so nearly in a line that they appear pentagonal : height and width about equal, widening upwards. Radial plates large, hexagonal, a little higher than wide; the lateral margins subparallel. Area of the arm-cicatrix large, covering the greater portion of the plate; its surface vertical, and elevated above the margins of the plate, subelliptical in form, with a small central foramen, and the upper margin excavated by the passage leading from the arms to the cavity of the body.

DOME consisting (apparently) of but five plates, somewhat unequal, alternating with the radials; their surfaces elevated into strong nodes, which are each covered with unequal pustules.

SURFACE of calyx-plates depressed-convex.

There are some indications of a division across the middle of the radial plates, passing horizontally through the central perforation; and another from the perforation upward to the arm-openings, making the apparent single plate to be made up of three plates; but these characters are obscure. Should they, however, be proved to exist, it will be necessary to separate this form from the Genus *MYRTILLOCRINUS* as now defined.

Geological formation and locality. In limestones of the Upper Helderberg group : near Caledonia, Livingston county. C. A. WHITE, collector.

GENUS HAPLOCRINUS (STEININGER).

THE following species clearly appertains to the Genus *HAPLOCRINUS*, if we are to judge from the structure of the body. A single specimen preserves the base of one of the arms attached to the ray; setting at rest the question as to the position and relations of the arms, so far as this species is concerned. Unfortunately, this minute and pretty species occurs in a limestone where the material is much broken and comminuted; and although we have numerous specimens of the body, no other portions are preserved in connection, except in the specimen mentioned.

Dr. TROOST has recognized several species of *HAPLOCRINUS* in the rocks of Tennessee, one of which is a common form : there is some obscurity about its structure, though it probably appertains to this genus. The similarity in form and general character of the smaller species of *STEPHANO-*
CRINUS may have sometimes induced their reference to *HAPLOCRINUS*, from which they differ in the structure of the body and in the character of the arms or tentacula.

HAPLOCRINUS CLIO (n. s.).

BODY very small, subangularly turbinate below the arm-openings, pentangular when viewed from above, with protruding arm-bases. Column-facet proportionally large, deeply impressed, the margin rounded. Basal plates five, very low. Three of the radial series consist of two plates each, and two consist of but one plate each : these latter are large, heptagonal, and rest directly upon the basal plates. In the series of two, the first plate is small, quadrangular in two rays and pentangular in one, all wider than high : the second plate is intermediate in size between the first and the large radials, quadrangular in two rays and pentangular in one. The centres of the five large radial plates are strongly protruding at the upper margins for the articulation of the arms, and show a foramen with a central septum passing into the interior cavity of the body.

DOME apparently composed of five triangular plates, their broad bases resting on two adjacent radials. The sutures of two summit plates unite over the middle of the radial plates, and have the lower lateral angles truncated, forming the upper border of the arm-openings. The summit-plates have grooved sutures, shallow in the lower part and becoming deeper above, truncating the top of the pyramid : when viewed from above, these grooves form a five-pointed stellate depression.

SURFACE of plates marked by fine, wrinkled, radiating striæ. Sutures in the calyx slightly impressed below, and more strongly near the top of the radial plates, the margins of which are thickened and the upper edges rounded over into the summit.

The arms appear to have been composed of long slender plates, articulated by a mitred end to the sloping cicatrix of the radial plate. The inner face is strongly grooved, corresponding to the size of the opening into the cavity of the body.

Geological formation and locality. In limestone of the Marcellus shale: Onondaga county. C. A. WHITE, collector.

GENUS NUCLEOCRINUS (CONRAD).

Nucleocrinus : CONRAD, in Journal Acad. Nat. Sciences, Philadelphia, Vol. viii, pa. 280, pl. 15, f. 17. 1843.

Olivanites : TROOST, MS.; and in Catalogue of Crinoidea, Trans. Am. Association for the Advancement of Science, 1849, p.

Elæocrinus : F. RÆMER, 1852.

The description of this genus by Mr. CONRAD in 1843, though very imperfect, is nevertheless accompanied by a figure, which sets at rest all question as to the fossil intended. The *Nucleocrinus elegans* (loc. cit. p. 280) is the one referred to as *N. halli* by VANUXEM (Report, p. 163), the latter name having been first applied to the species by CONRAD.

I am not aware at what time the name *Olivanites* was first published by TROOST, though I believe no description was ever given by him. In the Geological Report of Tennessee for 1841, the species (*O.*) *verneuili*, afterwards made the type of the Genus OLIVANITES, is placed under the Genus PENTREMITES. In 1849, the name *Olivanites* was published in TROOST's Catalogue as cited. The species *Nucleocrinus* (*Olivanites*) *verneuili*, being a comparatively common form in the West, was widely known under the name *Olivanites*; while the original of *Nucleocrinus*, being extremely rare, was little known.

In 1852, Dr. F. RÆMER published his description of ELÆACRINUS

for the original of TROOST's Genus OLIVANITES; recognizing the specific name *verneuili*, given by Dr. TROOST.

I conceive that there can be no doubt as to the propriety of restoring the earliest name; and I have therefore adopted Mr. CONRAD's name of NUCLEOCRINUS.

Regarding only the general form of these bodies, this genus would include several species, heretofore described under PENTREMITES, from the Carboniferous limestones of the Western States, viz : *Pentremites norwoodi*, OWEN and SHUMARD; *P. melo*, OWEN & SHUMARD; *P. curtus*, SHUMARD, and others; while the *Pentremites* (*Olivanites*) *verneuili* = *Elæocrinus verneuili*, RÆMER, and *Olivanites angularis*, LYON, are of the age of the Upper Helderberg limestones; and the *Nucleocrinus elegans*, CONRAD, and at least one other species, occur in the Hamilton group. The *Pentremites ræmeri*, SHUMARD, is referred to the Chemung group.

Looking at other characters than those of general form, the specimens before me scarcely warrant the union of all these species under the Genus NUCLEOCRINUS or ELÆCRINUS. In *Nucleocrinus elegans*, and allied forms, we have three small basal plates and five short radials, which embrace the base of the pseudambulacral fields; while the interradial plates are extremely large, extending nearly the whole length of the pseudambulacral areas. The anal side is often, or usually, flattened, a little broader than the others, and is marked by a narrow lanceolate plate, which extends from the opening to the summit of the radial plates, resting upon them; thus, as it were, dividing the interradial plate, leaving a narrow portion on each side adjacent to the pseudambulacral fields. The central area at the summit, between the ovarian openings, is occupied by several small plates, which, in *N. elegans*, converge to the centre.

In the structure of the body, the typical forms of this genus differ from PENTREMITES in the short radial plates and extremely elongated interradials, which fill nearly all the space between the pseudambulacral areas; while the elongate anal plate is a marked feature. Now when we compare *Pentremites norwoodi* and *P. melo*, we have the same general form of body, with the extremely elongate, instead of the short, radial or forked plates which embrace the pseudambulacral fields; and a small interradial at the summit. The ovarian apertures, as well as perhaps the central opening, sometimes preserve minute plates, which close these orifices. The form alone can scarcely be of generic importance; for, although the base of NUCLEOCRINUS is usually concave, I have before me a species where the base is not

concave, and the three basal plates are quite prominent. The only conspicuous difference between *P. norwoodi* and *P. godoni* and others of the latter form, is in the depressed base and greater rotundity of the former species, giving to it its similarity to NUCLEOCRINUS. The *P. norwoodi* and *P. melo* have not the anal side conspicuously wider, more prominent, or flattened; which is the character observed in all true NUCLEOCRINI.

The different arrangement of parts, also, in the two genera, causes a different mode of increase in the plates, and a different surface-character.

There is likewise an intermediate form represented by the GRANATOCRINUS of TROOST (*Pentremites granulatus* [?] of REEMER). This species is elliptical in form, with depressed base embracing in the bottom of the cavity the three small basal plates, while the radial plates reach halfway up the sides of the body. The anal side is not conspicuously different from the others, and the summit is unlike NUCLEOCRINUS; while it is more nearly like *Pentremites norwoodi*. This species is strongly granulose or tuberculose. The *Pentremites sayi* appears to me to belong to the same type : its base is not depressed, leaving the three basal plates protruding; while the radial plates reach about one-third the entire length, in this respect approaching NUCLEOCRINUS. In both these species the plate on the anal side occupies the entire space between the pseudambulacral fields, presenting scarcely any important difference from the other interambulacral or interradial spaces.

I would therefore suggest the separation of the species under the name originally given by Dr. TROOST, viz. GRANATOCRINUS.

The Genus NUCLEOCRINUS of CONRAD may be characterized as follows :

GENUS NUCLEOCRINUS (CONRAD, as emended).

GENERAL form of body elliptical or ovoid, supported on a slender column. Basal plates three, minute. Radials five, small and not deeply forked, receiving the bases of the narrow elongate pseudambulacral fields. Interradial plates six, four of them elongate, broadly lanceolate, truncate or concave on the lower side, and occupying the space between the pseudambulacral areas : a narrow intercalated plate on the anal side reaches from the aperture to the radial plate, dividing the interradial on that side into two narrow curving plates. Oral aperture central; the summit occupied by five or more plates. Ovarian apertures in five pairs at the extremities of the pseudambulacral fields. Anal aperture lateral;

its course and margin marked by the prominence or greater width of one of the interambulacral spaces on that side, owing to the intercalation of the anal plate.

SURFACE striato-cancellate or striato-granulose.

The structure given above differs in some essential features from that usually recognized in these fossils. The narrow lanceolate space in the centre of the interradial plates, which is always differently marked from the portion on either side, and usually more elevated (though in one species it is depressed), has been regarded as a distinct plate; but after an examination of all the specimens accessible to me, I am unable to find evidence of a suture-line bounding it; while on the anal side, the narrow plate, which is nearly of the same form, is limited by a distinct suture-line. I have therefore been compelled to give this signification to the different parts.

NUCLEOCRINUS ELEGANS.

Nucleocrinus elegans : CONRAD, Journal Acad. Nat. Sciences, Philadelphia, Vol. viii, p. 280. 1842.

Nucleocrinus halli, cited by VANUXEM, Geological Report of the Third District of New-York, p. 163.

GENERAL form subangularly ovoid or subelliptical, smaller at the base, which is somewhat deeply concave at the point of attachment of the column. The pseudambulacral fields are swollen out on the sides and terminate in prominent angles below, giving the base a pentangular form. The intervening or interradial spaces are scarcely or but slightly concave above, but become distinctly so below the middle and at the base. From the angles at the base of the pseudambulacral areas, five well-defined ridges extend to the margin of the column-cavity. Summit flattened.

BASAL plates small, extending only to the margin of the column-cavity. Radial plates short, forming but a small part of the height of the body, very slightly notched, and receiving only the base of the pseudambulacral fields; their upper ends directed obliquely, and fitting into the concave lower ends of the interradial plates. On the anal side, the upper extremities on one side of two adjacent radials are shorter than the others, owing to the extension of the anal plate : interradial plate broad-lanceolate, except on the anal side, where it is divided, leaving two narrow plates. Anal plate sublanceolate, the base occupying the entire width between the pseudambulacral fields. Poral pieces on each side the pseudambulacral fields, from thirty-five to forty-three (in specimens of different sizes). Centre of the summit occupied by five or more small plates.

SURFACE of radial plates striate. A lanceolate space embracing the full width of the interradial plates at the base, and terminating in a narrow point above, is striato-granulose with transverse undulating striae; while the area between this and the pseudambulacral field is marked by strong, longitudinal, abruptly undulating striae.

The largest specimens of this species which have been observed, are scarcely half an inch in height. In an older specimen, the greatest width is equal to the height; while in a younger one, it is less. The larger of these specimens before me is the one from which the original figure and description of Mr. CONRAD was made.

Geological formation and locality. In the shales of the Hamilton group: at Moscow, Livingston county.

NUCLEOCRINUS LUCINA (n. s.).

BODY elliptical, the greatest width above the middle, deeply pentalobate near the base and less deeply above: base almost flat. Basal plates nearly on a plane with the radials at the base of the pseudambulacral fields, and bearing an elongate node in the centre. Radial plates short, embracing only the base of the pseudambulacral fields. Interradial plates elongate, broad lanceolate, reaching the summit. Anal plate prominent above, not reaching the summit, leaving narrow portions of the interradial plate on each side. Centre of the summit a little flattened: the oral plates not determined.

SURFACE striato-granulose.

This species is more deeply lobed, and comparatively broader at base, than the *N. (Olivanites) angularis* of LYON; and is in all respects a very distinct species. Length from one-half to one inch.

Geological formation and locality. In the shales of the Hamilton group: Livingston county and elsewhere. C. A. WHITE, collector.

NUCLEOCRINUS LUCINA, var.

A large specimen, possessing the same general characters as the preceding, is more expanded in the upper part of the body, with the base proportionally narrower. This may possibly be only a variety of form, which a larger number of specimens might show to be a phase common to older individuals.

NUCLEOCRINUS VERNEUILI.

Pentremites verneuili : TROOST.

Olivanites verneuili : TROOST.

Elaeocrinus verneuili : RÆMER.

This species, which is common in Kentucky and in the limestone at the Falls of the Ohio, and likewise in the State of Ohio, appears under considerable variety of form. It has been illustrated by Dr. F. RÆMER in his Monograph of the Blastoidea, and by Mr. S. S. LYON in the Geological Report of Kentucky.

A single specimen, bearing the general features of this species, though only one-quarter of an inch in length, has been found by Mr. WHITE at Stafford in Genesee county. The base of the specimen is not concave, but protruding; which I attribute to its young state. Farther collections may prove it to be a distinct species; in which case, I propose the name *Nucleocrinus conradi*.

The *Nucleocrinus angularis* of LYON has the sides flattened above and concave below; the ambulacral fields forming prominent angles which are approximate below, leaving a narrow base.

GENUS PENTREMITES (SAY).

PENTREMITES LEDA (n. s.).

BODY ovate, the greatest width below the centre, triangular at the junction with the column : distance from the column to the base of the pseudambulacral fields less than one-fourth the entire height. Basal plates small, one quadrangular and two pentangular. Radial plates elongate, narrow, deeply forked; the greatest width of the extremities equal to one-fourth the length of the plate. Interradial plates small, quadrangular or lozenge-shaped, longer above than below the point of greatest diameter. Pseudambulacral fields long, narrow, slightly widening upward and grooved along the centre, composed of a double series of ornamented poral plates; the plates about eighteen to one-fourth of an inch. Summit openings small.

SURFACE marked by very fine, equal, threadlike striæ, parallel to the margins of the plates.

Geological formation and locality. In the shales of the Hamilton group: Western New-York. C. A. WHITE, collector.

PENTREMITES CALYCE (n. s.).

A specimen having many of the characters of the above species, presents a much greater width of body in proportion to the height. The pseudambulacral fields are also broader, and do not widen towards the top; and the poral plates are a little larger. The striae of the surface are more distinct, and the interradial plates are marked on the upper end by several very small nodes; a character which has not been observed in the *P. leda*.

Geological formation and locality. In the shales of the Hamilton group: Western New-York.

PENTREMITES MAIA (n. s.).

BODY elongato-ovate; greatest width just above the base of the pseudambulacral areas. Base small, sharply triangular near the junction of the very small column. Basal plates short, forming about one-third of the height below the pseudambulacral fields. Radial plates narrow, elongate, forked about four-fifths of their length. Interradial plates minute, quadrangular or lozenge-shaped. Pseudambulacral fields narrow, widening towards the summit, convex, slightly elevated above the margins of the radial plates, composed of a double series of highly ornamented poral plates; the plates about twelve in one-fourth of an inch. Summit openings very small.

SURFACE marked by fine threadlike striae parallel to the margins of the plates.

This species differs from *P. leda* in the character of the base, which is smaller, more elongate and attenuate, and more distinctly triangular: also in the pseudambulacral fields, which are composed of longer plates, giving only two-thirds as many in an equal distance.

Geological formation and locality. In shales of the Hamilton group: Moscow, N.Y. 1837.

PENTREMITES WHITEI (n. s.).

BODY small, somewhat broadly turbinate below the base of the pseudambulacral fields, constricted just above, and rounded at the summit; pentalobate in a basal view. The pseudambulacral fields extend a little more than half the length of the body. Base small, slightly pentangular: basal plates reaching about halfway to the base of the pseudambulacral fields. Radial plates deeply furcate, with the pseudambulacral areas extending about two-thirds their length. Interradial plates comparatively large, lozenge shaped.

THE pinnules or arms are preserved on the specimen to about twice

the length of the body, and are still imperfect at the extremities : they are composed of joints, which are longer than wide, longitudinally striate and somewhat nodose-carinate on the back; with the inner margins apparently giving origin to minute tentacula. SURFACE of body-plates finely striate. Length of body a little more than half an inch.

The specimens which have been examined are crushed, and the true form cannot be fully known; but it appears to have resembled in shape the *P. puzo*.

Geological formation and locality. Shales of the Hamilton group: Western New-York. C. A. WHITE and R. P. WHITFIELD, collectors.

PENTREMITES LYCORIAS (n. s.).

BODY subfusiform, attenuate below, tapering gradually to the column : base triangular; summit obtuse. The basal plates occupy about one-third the entire length of the body; their upper faces nearly transverse, or scarcely indented by the radial plates. The radial plates long and narrow, divided for about one-half their length, strongly protruding at the base of the pseudambulacral fields, giving a decided pentangular form, attenuate above : interradial plates minute. Pseudambulacral fields rapidly expanding from the base upwards, and covered by the pinnules so that the number of poral plates cannot be determined. Pinnules extending above the summit to a height equal to the length of the body, which is about three-fourths of an inch. The greatest breadth of the body, at the base of the pseudambulacral fields, is a little more than three-tenths of an inch.

SURFACE marked by extremely fine threadlike striae, which are parallel to the suture-lines. Column round, long, slender, and composed of very short joints.

This species is more attenuate at base than *P. pailleti*, and the pseudambulacral fields are proportionally longer.

Geological formation and locality. In the shales of the Hamilton group, in several counties in Western New-York.

GENUS ELEUTHEROCRINUS (SHUMARD)*.

ELEUTHEROCRINUS WHITFIELDI (n. s.).

BODY small subelliptical, triangular and pointed at base, and truncate at summit : length a little more than twice the greatest width. Dorsal side (or side of ambulacral fields) irregularly convex, becoming angular in the upper part. Ventral basal plate very

* In Proceedings of Acad. Nat. Sciences, Philadelphia, 1856.

small, subquadrangular or lozenge-shaped; the others elongato-lingulate, reaching half the height of the body; the margins subparallel.

THE two regular radial plates are long, slender, deeply furcate, receiving the ambulacral areas. The lateral radial plates irregular, having their ventral extremities similar to those of the regular radials, and the dorsal extremities elongate triangular, and curved to unite with the elongate basal and short dorso-radial plates. Dorsal or short radial plate shield-shaped or irregularly subovate, truncate and strongly angular at the top for the reception of the summit-pseudambulacral field. Interradial plates minute. Four of the pseudambulacral fields long and slender, extending about four-fifths of the entire length of the body, as wide as the limbs of the regular radial plates, composed of a double series of short obliquely arranged and beautifully ornamented poral plates, which number about sixteen to one-fourth of an inch. The fifth pseudambulacral field small, triangular, horizontal at the summit of the body, composed of eight or ten curved plates on each side. Each plate of the pseudambulacral field supports a long slender arm or tentacle, composed of a double series of short plates interlocking on the back. In the lower part, the breadth from the back to the inner face is about three times the transverse diameter, gradually decreasing in the extension upwards, and becoming about equal to the transverse diameter: here they appear to be grooved on the face, and marked with small scars as if for the attachment of cilia. The arms have been preserved, in some instances, to a length equal to two-thirds the length of the body, and are yet imperfect at their distal ends.

This species is the second of the genus that has been discovered. The *E. cassedayi* of SHUMARD occurs in limestones of the age of the Upper Helderberg rocks near Louisville, Kentucky; and the present species, in the shales of the Hamilton group in Western New York. This differs from the western species in having the long basal plate much narrower, the short radial plate distinctly angular in the middle, and the pseudambulacral areas wider, while the entire width is proportionally less than in that species. C. A. WHITE, collector.

GENUS CODASTER = CODONASTER (M'Coy).

CODASTER PYRAMIDATUS.

The *Codaster pyramidatus* of SHUMARD, or a closely allied species, occurs in the Upper Helderberg limestone, near Caledonia in Livingston county, N.Y.

July, 1862.

THE greater proportion of the species of Crinoidea described in the preceding pages are of the collections of Mr. C. A. WHITE, made during the summer and autumn of 1860 : some are from the collections of 1859, by Mr. C. A. WHITE and Mr. R. P. WHITFIELD, made for the Palæontology of New-York. The *Cacabocrinus speciosus*, and some specimens of *ANCYROCRINUS*, are from the State Collection; and a few others, not particularly indicated, have been in my own cabinet many years.

Heretofore the species of Crinoidea known in the Upper Helderberg and Hamilton groups have been so few, that they afforded but unsatisfactory evidence of the character of this fauna during those geological periods.

Several other species still remain undescribed; and from the experience of the past three years, I have no doubt but the Hamilton group will ultimately yield a much larger number than we yet know.

The genera now known amount to seventeen, including two or three which may be considered subgenera.

The accompanying diagrams of *Nucleocrinus elegans* illustrate the structure of that species, as well as of the genus.

FIG. 1.

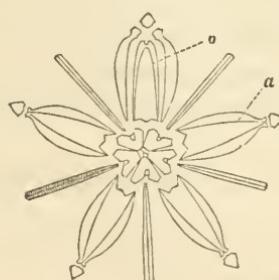


FIG. 1. Nat. size. The central part consists of the three small basal plates, and the five short radial plates. *a*, The interradial plate, with the small summit plate near the apex. *b*, The anal plate, margined by the two narrow curving interradial plates of the anal side. The linear pieces represent the pseudambulacratal fields.

FIG. 2.

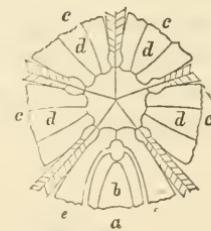


FIG. 2. Summit enlarged, showing the form and relative position of the summit plates. *a*, Anal plate; *b*, indicates the smooth space, which occupies the middle of the plate. *c*, The interradial plates, *d*, their smooth spaces. *e*, The irregular, curving interradial plates of the anal area.

OBSERVATIONS UPON A NEW GENUS OF BRACHIOPODA.

IN the Thirteenth Report of the Regents on the State Cabinet of Natural History, page 69, I called attention to the characters of *Atrypa? modesta*, and the internal spires of that fossil. I have lately received, through the kindness of Dr. CHARLES ROMINGER of Ann Arbor, Michigan, some very interesting specimens of this species, in which the direction and relations of the internal spires appear to be fully shown. The crura spread from the rostral cavity almost rectangularly towards the lateral margins, curving with the shell to near its base; and thence recurving, they make about three volutions, with the apices of the spires directed obliquely into the cavity of the dorsal valve. The outer limbs of the two spires are connected by a band, or loop, stretching across the entire space with a gentle curve towards the beak, and exterior to the spires on the dorsal side.

The direction of the spires is nearly the same as in *ATRYPA*, differing in the presence of the strong loop; while the shell, in its exterior character, is quite unlike *ATRYPA*. In two specimens examined, there is a slight variation in the direction and extent of the loop. In one, it rises from below the middle of the outer curve of the spiral, and, curving gently, passes over the apices of the spires. In the other, the origin of the loop appears to be at a higher point, or otherwise it lies parallel with the outer curve of the spiral for some distance, and stretches from one side to the other between the spires and the base of the crura. This difference may be accidental, or may be caused by displacement of the loop in one case : in both, however, the essential features are preserved.

For the Brachiopoda of this character, I propose the name *ZYGOSPIRA**.

GENUS ZYGOSPIRA (n. g.).

SHELLS bivalve, equilateral, inequivalve : surfaces plicate in the typical species; a sinus on the dorsal valve. Internal spires arranged somewhat as in *ATRYPA*, with a broad loop passing from the outer limbs of the spiral band antirely across from side to side, near to or above the centre, and close to the inner side of the dorsal valve.

* Gr. ζυγος, *jugum*; σπειρα, *spira*.

The *Atrypa modesta* (loc. cit.) is the typical species of this genus, the interior of which is shown in the accompanying illustrations. Both figures are much enlarged : fig. 1 represents the dorsal valve removed, and shows the loop as actually seen in the specimen, extending across the centres of the spires. Fig. 2 represents another specimen with the ventral valve removed, and the spires lying in the dorsal valve ; the loop being shown in the position actually seen in this specimen*.

FIG. 1.

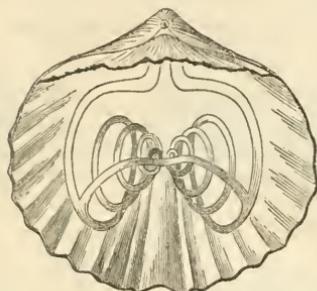
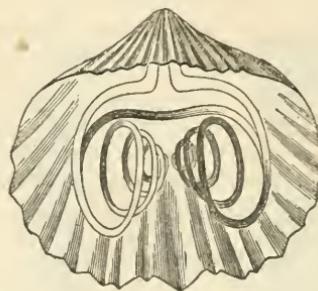


FIG. 2.



* By grinding or polishing the surfaces, and macerating in acid, the internal spires are frequently shown in a satisfactory manner.

EXPLANATIONS OF PLATES.

PLATE 1.

- Fig. 1. *PLATYCRINUS ERIENSIS*, enlarged two diameters : page 119.
- Fig. 2 - 4. *MYRTILLOCRINUS AMERICANUS*, enlarged two diameters. 2 and 3, lateral views; 4, basal view. Page 142.
- Fig. 5 - 9. *HAPLOCRINUS CLIO*, enlarged six diameters : p. 143. 5 and 6, lateral views, showing one ray of two plates and another of one plate; 7, base of same; 8, view of summit of same; 9, lateral view of another specimen, showing the first plate of the arm on one ray.
- Fig. 10. *PENTREMITES MAIA* : p. 150.
- Fig. 11. *PENTREMITES LEDA* : p. 149.
- Fig. 12 & 13. *CODASTER PYRAMIDATUS* : p. 152.
Lateral and summit views.
- Fig. 14 & 15. *NUCLEOCRINUS ELEGANS* : p. 147.
14, lateral view; 15, enlargement of one interambulacral space, with the adjacent poral plates.
- Fig. 16. *NUCLEOCRINUS LUCINA* : p. 148.
- Fig. 17. *CHEIROCRINUS CLARUS* : p. 116.
View of an entire individual, natural size : the root is attached to a fragment of a column of another crinoid.
- Fig. 18. Roots, apparently of *CHEIROCRINUS*, attached to other crinoid columns.
- Fig. 19 - 22. *CYATHOCRINUS BULBOSUS* : p. 123.
19, basal view, with part of one arm shown; 20, lateral view showing height of body, a small part of one arm remaining attached; 21, upper side of a small individual, showing the central cavity and the spreading and broadly grooved arms; 22, exterior view of the spreading arms of a larger individual, from which the body has been broken off.
- Fig. 23 & 24. *EDRIOCRINUS PYRIFORMIS* : p. 116.
23, lateral view; 24, view of the summit of the specimen.
- Fig. 25 & 26. *ANCYROCRINUS BULBOSUS* : p. 118.
25, a large specimen preserving about seven inches of the column attached; 26, a young individual.
- Fig. 27 & 28. *ANCYROCRINUS SPINOSUS* : p. 119.
27, lateral view; 28, view of summit.

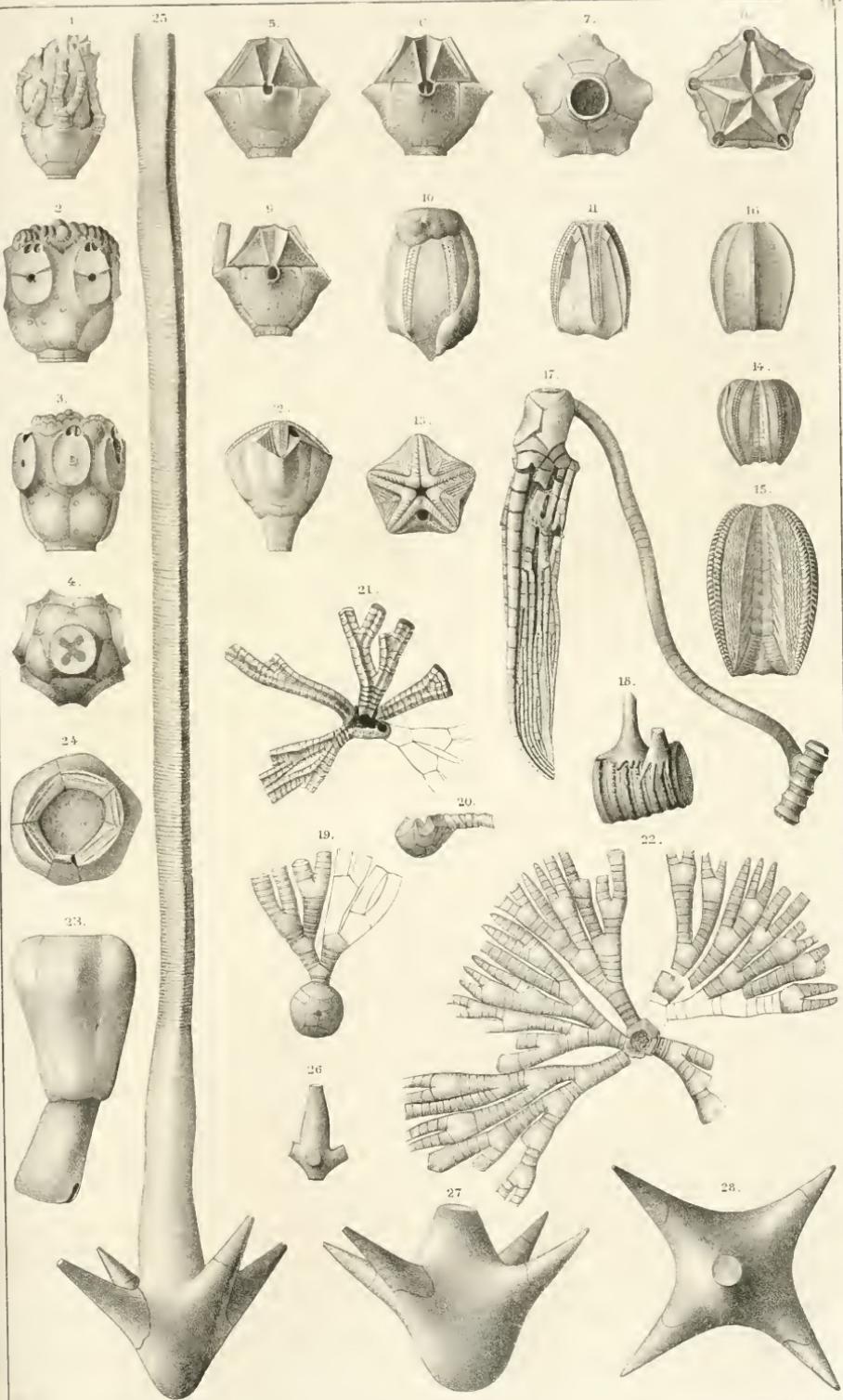


PLATE 2.

Fig. 1. ORTHIS EMACERATA. Dorsal valve.

Fig. 2. " " Interior of the ventral valve.
Thirteenth Annual Report on the State Cabinet, page 121.

Fig. 3. " " Interior of a ventral valve of the form ordinarily referred to *O. testudinaria*.
From the same geological position.

Fig. 4. ORTHIS CLYTIE. Dorsal view.

Fig. 5. " " Interior of ventral valve.
Fourteenth Annual Report on the State Cabinet, p. 90.

Fig. 6 - 8. ORTHIS[?] ELLA.
Thirteenth Ann. Report id. p. 121. = *Trematospira?* *ella*.

The specimens figured show the extremes of variation in number of plications, etc. The species is not an ORTHIS, but possesses characters belonging to TREMATOSPIRA, but with a more distinct area than has been observed in any species of that genus; while there is no sinus upon the ventral valve.

Fig. 9 - 11. TREMATOSPIRA HIRSUTA.

Fourteenth Annual Report on the State Cabinet, p. 101.
= *Atrypa hirsuta*. Tenth Ann. Report id. p. 128.

Fig. 12 - 14. " " Dorsal, front, and profile views of a large individual, in which the mesial fold and sinus are strongly developed.

Fig. 15 & 16. " " Interior of the ventral & dorsal valves.

Fig. 17 - 25. MERISTELLA? UNISULCATA = *Atrypa unisulcata*: CONRAD,
Annual Report of 1841.

See Fourteenth Annual Report on the State Cabinet, p. 101.

Fig. 17 is a cardinal view of a well-preserved form from the Upper Helderberg limestone; in which there is a ridge-like fold on the dorsal valve, parallel with and close to the hinge-line or cardinal margin of the valve. In fig. 18, a specimen from the Hamilton group, this fold is more oblique, rising from near the beak, as shown in the figure, while there is a second fold on the side of the shell. Fig. 19 is a specimen from the Upper Helderberg limestone of the West; in which the fold is sharp and clearly defined, slightly oblique, and intermediate to the former two: the specimen is more gibbous than those from the limestone of New-York*. Figs. 20 & 21 are ventral and dorsal views of a large specimen from the limestone of New-York; Fig. 22, profile of the same; Fig. 23, front view of the same. Fig. 24, interior of the dorsal valve, showing a median septum, cardinal process, teeth, sockets, and bases of the crura. Fig. 25, interior of ventral valve, showing the teeth and muscular impression.

These figures (24 & 25) are from specimens, before referred to, as furnished through the kindness of Mr. S. S. Lyon, from the limestone of the Falls of the Ohio.

* For the present, and until farther investigation, I would propose to designate the Hamilton form as *M. unisulcata*, var. *biplicata*; and the western form as *M. unisulcata*, var. *uniplicata*.

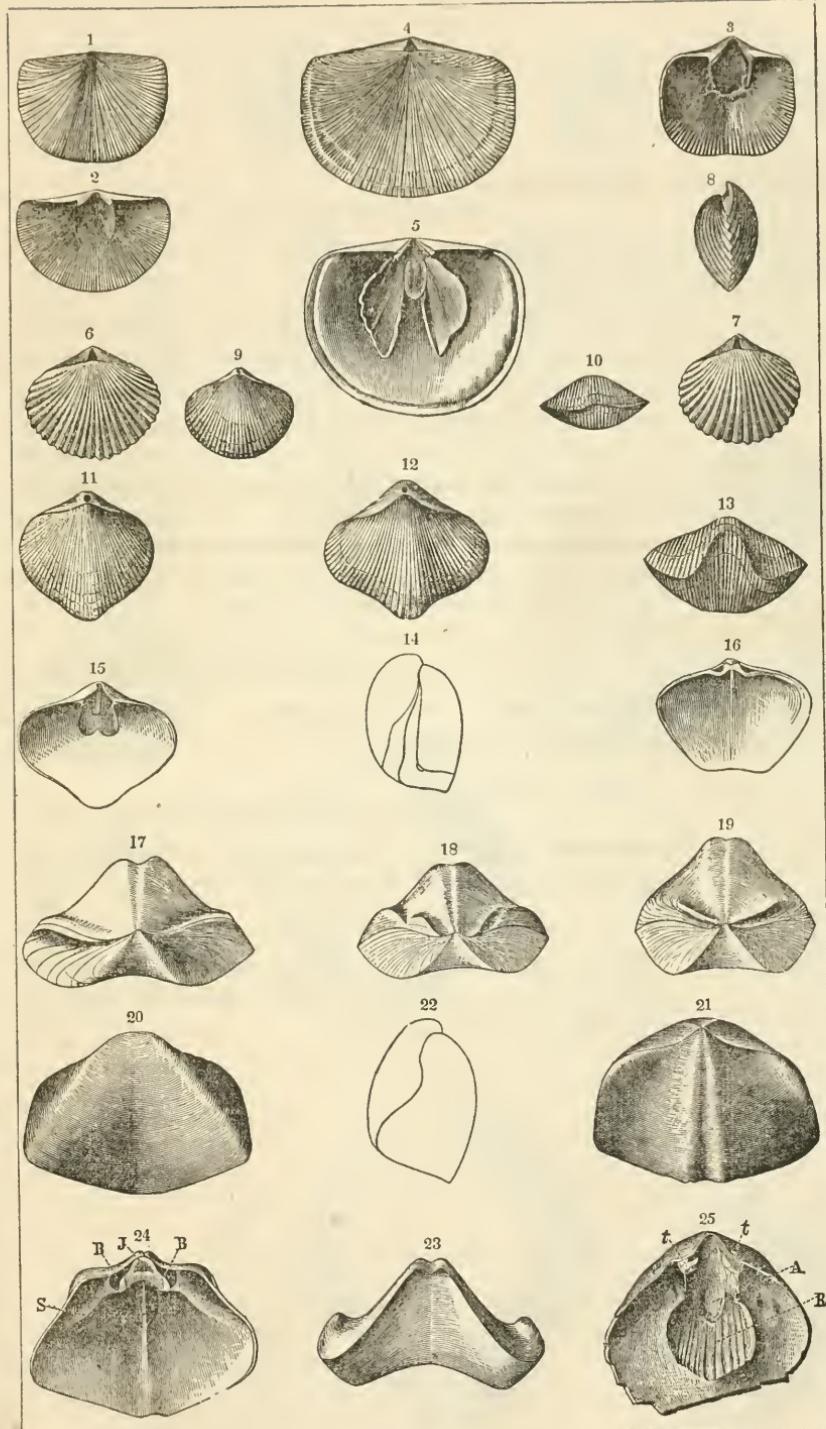


PLATE 3.

Fig. 1, 2 & 3. *CENTRONELLA IMPRESSA*.

Fourteenth Report on the State Cabinet, p. 102.

Fig. 4 & 5. Interior of dorsal and ventral valves of the same.

Fig. 8 & 9. *CRYPTONELLA*. Generic illustrations.

See pages 101 & 102 of the Fourteenth Report on the State Cabinet.

Fig. 6 & 7. *CRYPTONELLA EXIMIA*. An undescribed species from the Lower Helderberg limestone. The form is ovate, narrowing towards the beak, which is sometimes elongate, slightly curving but not incurved, perforate at the extremity, with the space below, between the perforation and the beak of the opposite valve, occupied by two deltoidal pieces. Surface marked by concentric striæ and some stronger lines of growth.

This species usually occurs in fragments or crushed : no specimens have, until now, been found sufficiently entire for illustration.

Fig. 10 & 11. *ATHYRIS ANGELICA*. Dorsal and ventral valves.

Fourteenth Report on the State Cabinet, p. 99.

Fig. 12 & 13. Front and profile views of the same.

Fig. 24. Cast of ventral valve of the same.

Fig. 15 & 16. *ATHYRIS CORA*.

Thirteenth Report on the State Cabinet, p. 94.

Fig. 17 - 19. *MERISTELLA NASUTA* = *Atrypa nasuta*, CONRAD. Figures showing gradations in size, and in the front extension.

Fig. 20. Profile view of specimen fig. 19.

Fig. 21 & 22. Dorsal and profile views of a large specimen, probably of this species. The prolongation in front is wider and more extended than in the ordinary forms.

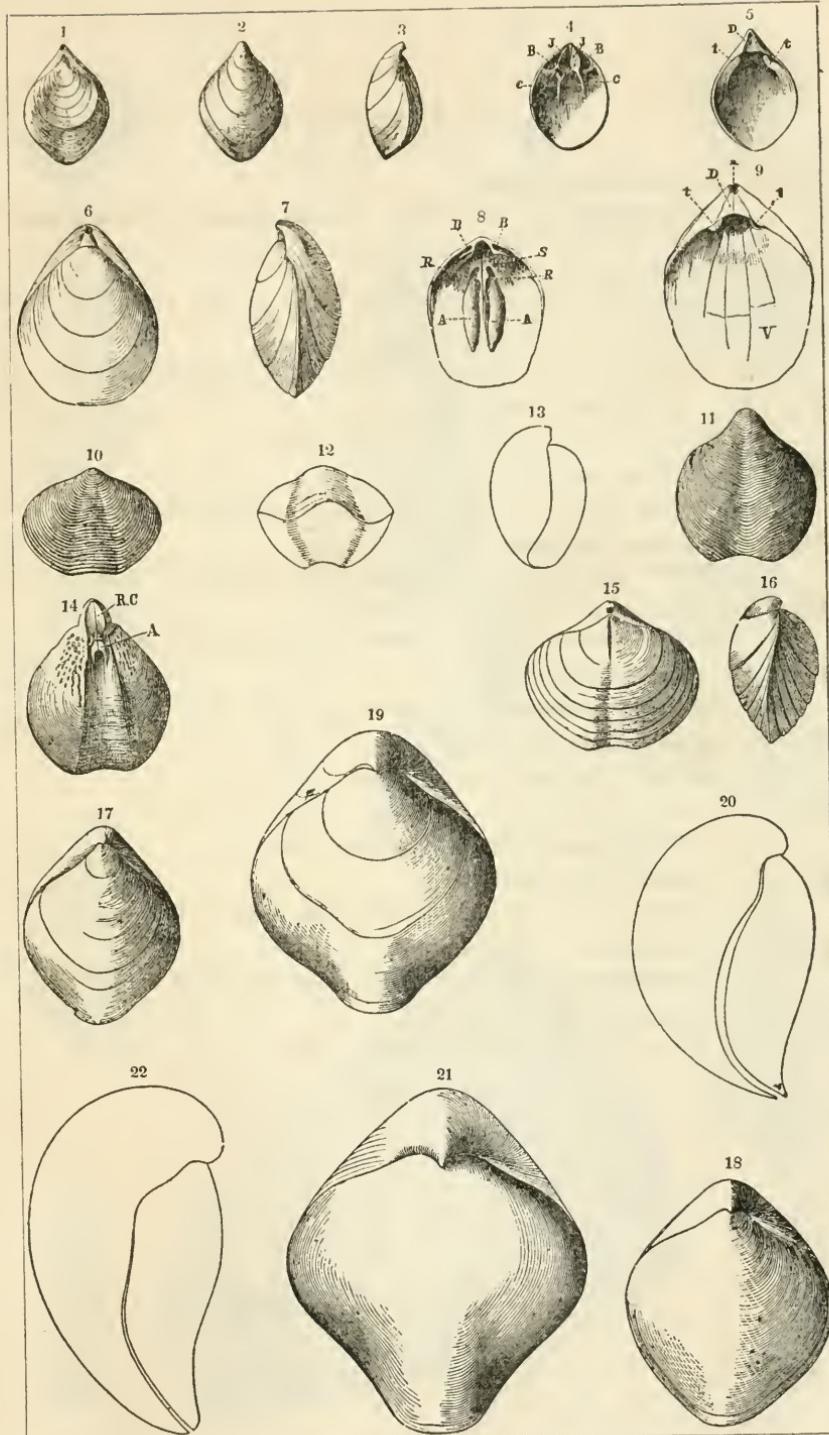


PLATE 4.

Fig. 1. *MACROCHEILUS HEBE.*

Fifteenth Report of the Regents on the State Cabinet, p. 49; Appendix C continued, p. 20.

Fig. 2. *MACROCHEILUS HAMILTONIÆ.*

Fifteenth Report on the State Cabinet, p. 49; Appendix C cont. p. 21.

Fig. 3. *MACROCHEILUS (HOLOPEA) MACROSTOMUS.*

Fifteenth Report on the State Cabinet, p. 49; Appendix C cont. p. 21.

Fig. 4 & 5. *LOXONEMA BELLATULA.*

Fourteenth Report on the State Cabinet, p. 104.

Fig. 6. *LOXONEMA SOLIDA.*

Fifteenth Report on the State Cabinet, p. 51; Appendix C cont. p. 23.

Fig. 7. *LOXONEMA ROBUSTA.*

Fifteenth Report on the State Cabinet, p. 52; Appendix C cont. p. 24.

Fig. 8. *LOXONEMA HAMILTONIÆ.*

Fifteenth Report on the State Cabinet, p. 53; Appendix C cont. p. 25.

Fig. 9. *LOXONEMA DELPHICOLA.*

Fifteenth Report on the State Cabinet, p. 52; Appendix C cont. p. 24.

Fig. 10. *MURCHISONIA LEDA.*

Fourteenth Report on the State Cabinet, p. 103.

Fig. 11. *MURCHISONIA MAIA.*

Fourteenth Report on the State Cabinet, p. 103.

Fig. 12. *MURCHISONIA DESIDERATA.*

Fifteenth Report on the State Cabinet, p. 50; Appendix C cont. p. 22.

Fig. 13. *MURCHISONIA TURRICULA.*

Fifteenth Report on the State Cabinet, p. 50; Appendix C cont. p. 22.

Fig. 14. *PLEUROTOMARIA KEARNEYI.*

Fourteenth Report on the State Cabinet, p. 105.

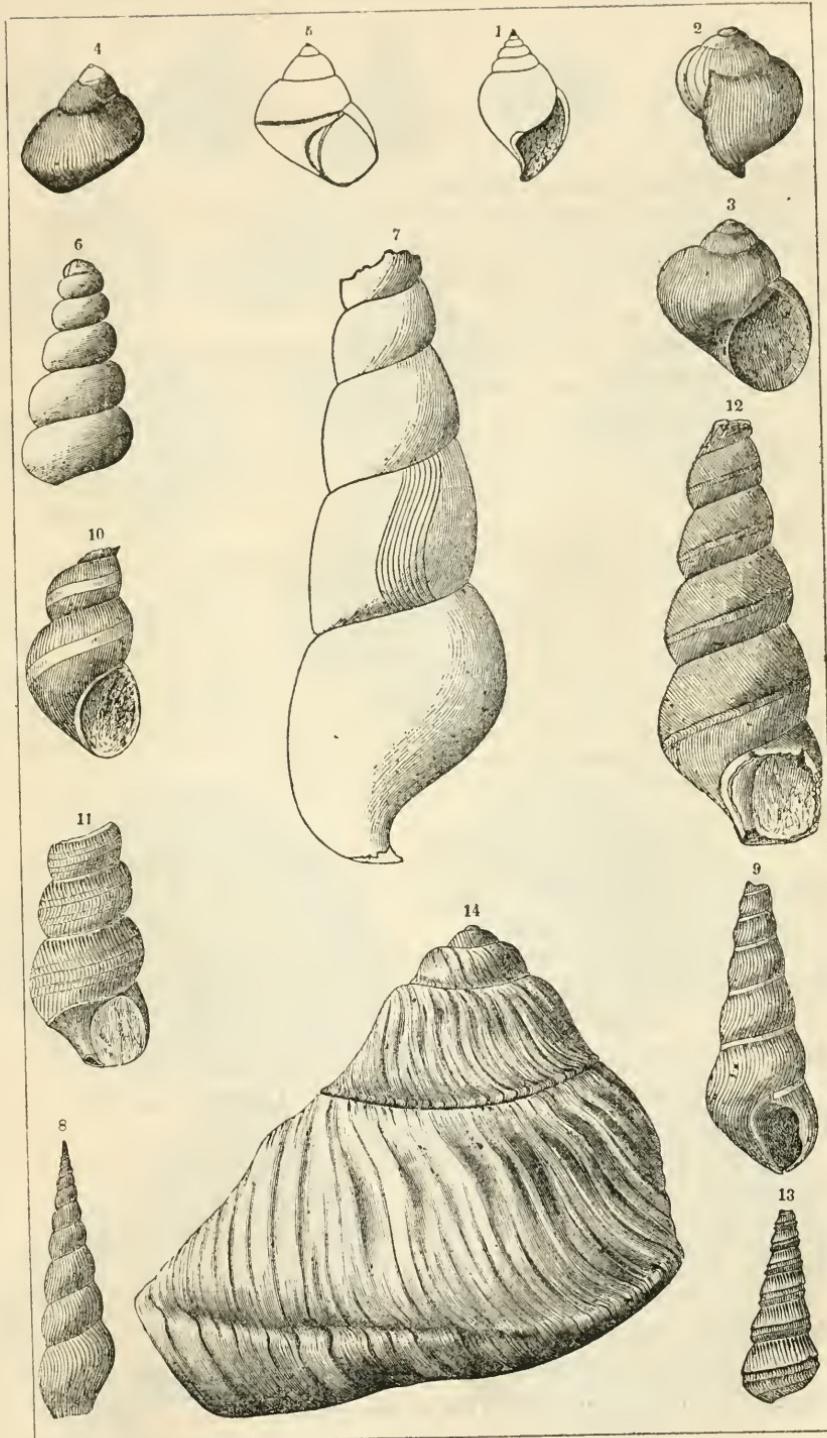


PLATE 5.

Fig. 1. PLEUROTOMARIA TRILIX.

Fifteenth Report on the State Cabinet, p. 45; Appendix C cont. p. 17.

Fig. 2. PLEUROTOMARIA CAPILLARIA.

Fifteenth Report on the State Cabinet, p. 45; Appendix C cont. p. 17.

Fig. 3. PLEUROTOMARIA LINEATA.

Fifteenth Report on the State Cabinet, p. 44; Appendix C cont. p. 16.

Fig. 4. PLEUROTOMARIA RUGULATA, preserving the shell.

Thirteenth Report on the State Cabinet, p. 108.

Fig. 5. PLEUROTOMARIA RUGULATA : east of the interior.

Thirteenth Report on the State Cabinet, p. 108.

Fig. 6. PLEUROTOMARIA DORIS.

Fifteenth Report on the State Cabinet, p. 43; Appendix C cont. p. 15.

Fig. 7 & 8. PLEUROTOMARIA HEBE.

Fourteenth Report on the State Cabinet, p. 105.

Fig. 9 & 10. PLEUROTOMARIA SULCOMARGINATA : CONRAD, 1842.

Fifteenth Report on the State Cabinet, p. 46; Appendix C cont. p. 18.

Fig. 11. PLEUROTOMARIA ROTALIA. An enlarged figure : the figure represents the species as too rotund.

Fifteenth Report on the State Cabinet, p. 46; Appendix C cont. p. 18.

Fig. 12. PLEUROTOMARIA LUCINA.

Fifteenth Report on the State Cabinet, p. 42; Appendix C cont. p. 14.

Fig. 13. PLEUROTOMARIA ARATA. A large individual, which is somewhat distorted.

Fifteenth Report on the State Cabinet, p. 43; Appendix C cont. p. 14.

Fig. 14. PLEUROTOMARIA ARATA. A smaller individual, preserving the natural proportions.

Fig. 15. CYCLONEMA HAMILTONIÆ.

Fifteenth Report on the State Cabinet, p. 47; Appendix C cont. p. 19.

Fig. 16. CYCLONEMA LIRATA.

Fifteenth Report on the State Cabinet, p. 47; Appendix C cont. p. 19.

Fig. 17. CYCLONEMA MULTILIRA.

Fifteenth Report on the State Cabinet, p. 48; Appendix C cont. p. 20.

Fig. 18. PLATYOSTOMA TURBINATA.

Fourteenth Report on the State Cabinet, p. 106.

Fig. 19. PLATYOSTOMA LINEATA : CONRAD.

Fifteenth Report on the State Cabinet, p. 40; Appendix C cont. p. 12.

Fig. 20. " " " View of the spire.

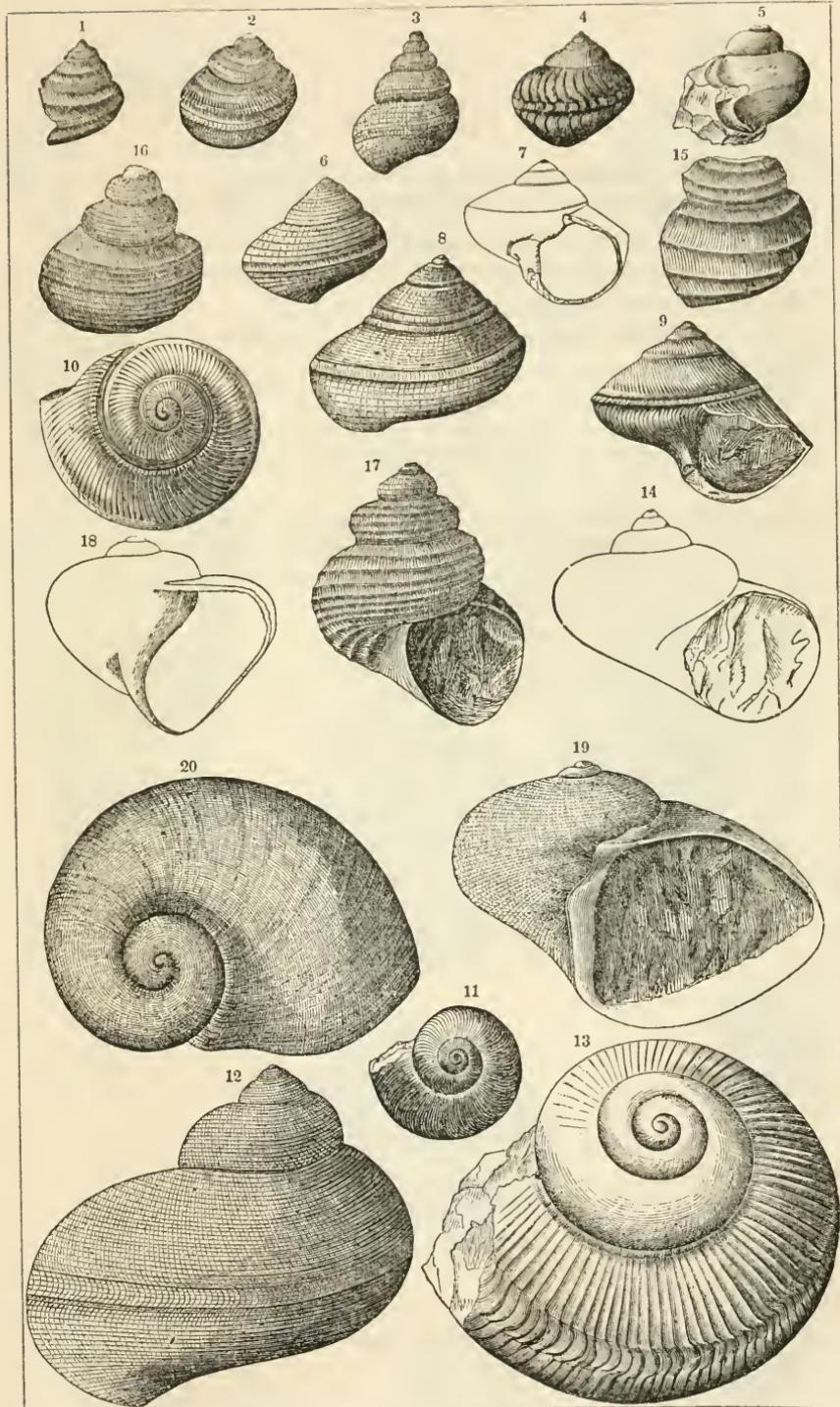


PLATE 6.

Fig. 1 & 2. *EUOMPHALUS [STRAPAROLLUS] LAXUS.*

Fifteenth Report on the State Cabinet, p. 54; Appendix C cont. p. 26.

Fig. 3. *EUOMPHALUS [STRAPAROLLUS] CLYMENTIOIDES.*

Fifteenth Report on the State Cabinet, p. 54; Appendix C cont. p. 26.

Fig. 4. *PLEUROTOMARIA EUOMPHALOIDES.*

Fifteenth Report on the State Cabinet, p. 46; Appendix C cont. p. 18.

Fig. 5 & 6. *PORCELIA? NAIS = GYROCERAS NAIS.*

Fifteenth Report on the State Cabinet, p. 68; Appendix C cont. p. 40.

A farther examination of this species does not disclose septa, which I had supposed to exist when referring it to the Genus *GYROCERAS*. It is probably a *PORCELIA*.

Fig. 7, 8 & 9. *BELLEROPHON CURVILINEATUS : CONRAD.*

Fifteenth Report on the State Cabinet, p. 55; Appendix C cont. p. 27.

Fig. 7, view of aperture; Fig. 8, lateral view showing the umbilicus; Fig. 9, lateral view of a cast.

Fig. 10 & 11. *CYRTOLITES PILEOLUS.*

Fifteenth Report on the State Cabinet, p. 61; Appendix C cont. p. 33.

This species may prove to belong to the Genus *CARINAROPSIS* or *PHRAGMOSTOMA*.

Fig. 12, 13 & 14. *PHRAGMOSTOMA NATATOR.*

Fifteenth Report on the State Cabinet, p. 60; Appendix C cont. p. 32.

Fig. 12, view of aperture; 13, dorsal view; 14, longitudinal section.

Fig. 15, 16 & 17. *PTEROPODICA SAFFORDI = CLIODERMA SAFFORDI.*

Fourteenth Report on the State Cabinet, p. 96.

Fig. 15, interior view, showing the broad septum; 16, transverse section showing the form and extent of the internal cavity; 17, longitudinal section, with the outline of the margin of the same specimen.

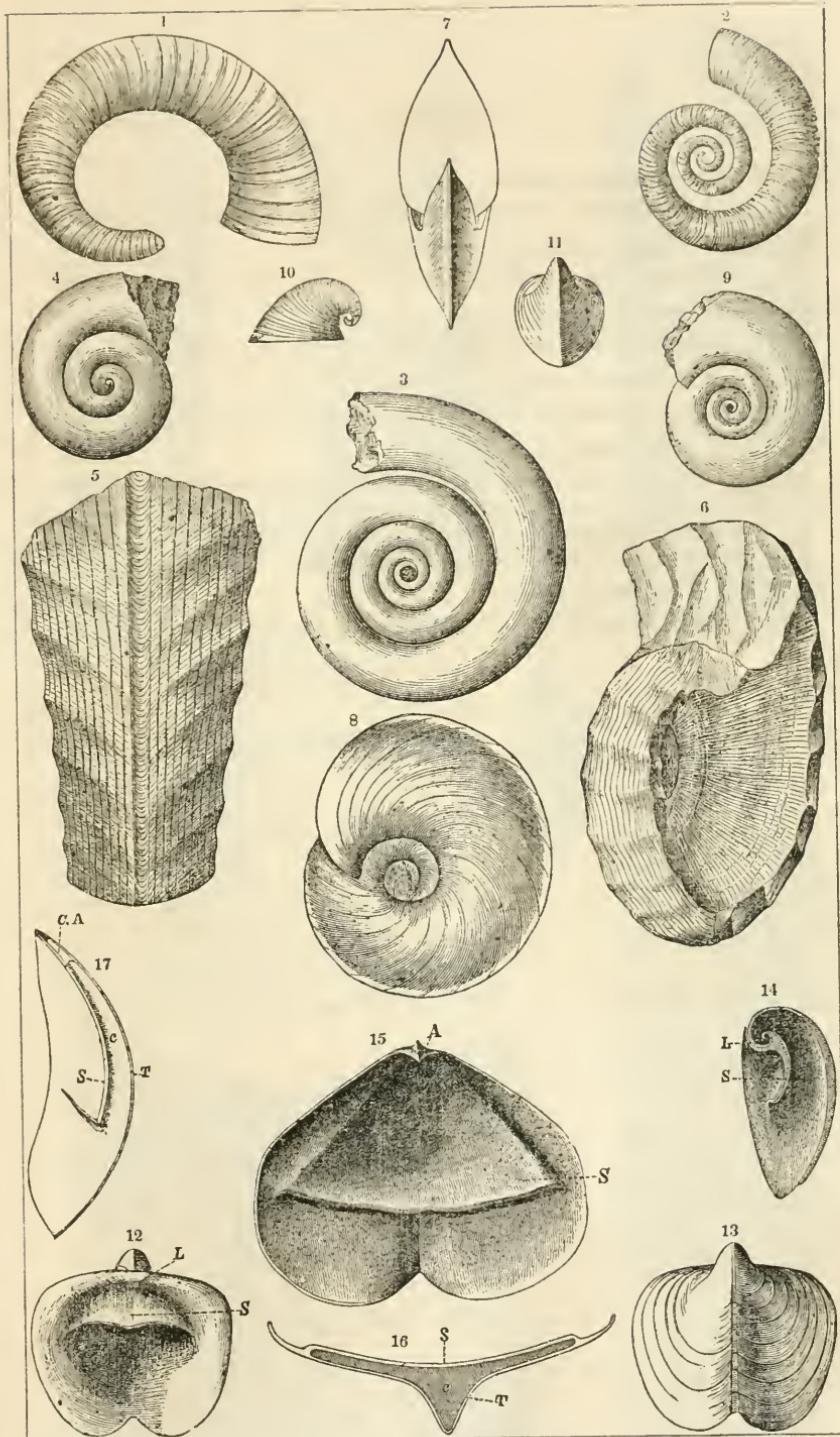


PLATE 7.

Fig. 1. *GOMPHOCERAS BETA.*

Fifteenth Report on the State Cabinet, p. 72; Appendix C cont. p. 44.

Fig. 2 & 3. *ORTHOERAS MULTICINCTUM.*

Fifteenth Report on the State Cabinet, p. 76; Appendix C cont. p. 48.

Fig. 4. *ORTHOERAS THOAS.*

Fifteenth Report on the State Cabinet, p. 75; Appendix C cont. p. 47.

Fig. 5. *ORTHOERAS HYAS.*

Fifteenth Report on the State Cabinet, p. 75; Appendix C cont. p. 47.

Fig. 6 & 7. *ORTHOERAS FOLIATUM.*

Fifteenth Report on the State Cabinet, p. 74; Appendix C cont. p. 46.

Fig. 6, the interior of a portion of the shell, showing the lamellose extensions into the surrounding stone; 7, a cast, or imprint, showing the sinuosity of the lamellose extensions on the anterior side.

Fig. 8. *ORTHOERAS PROFUNDUM.*

Fifteenth Report on the State Cabinet, p. 76; Appendix C cont. p. 48.

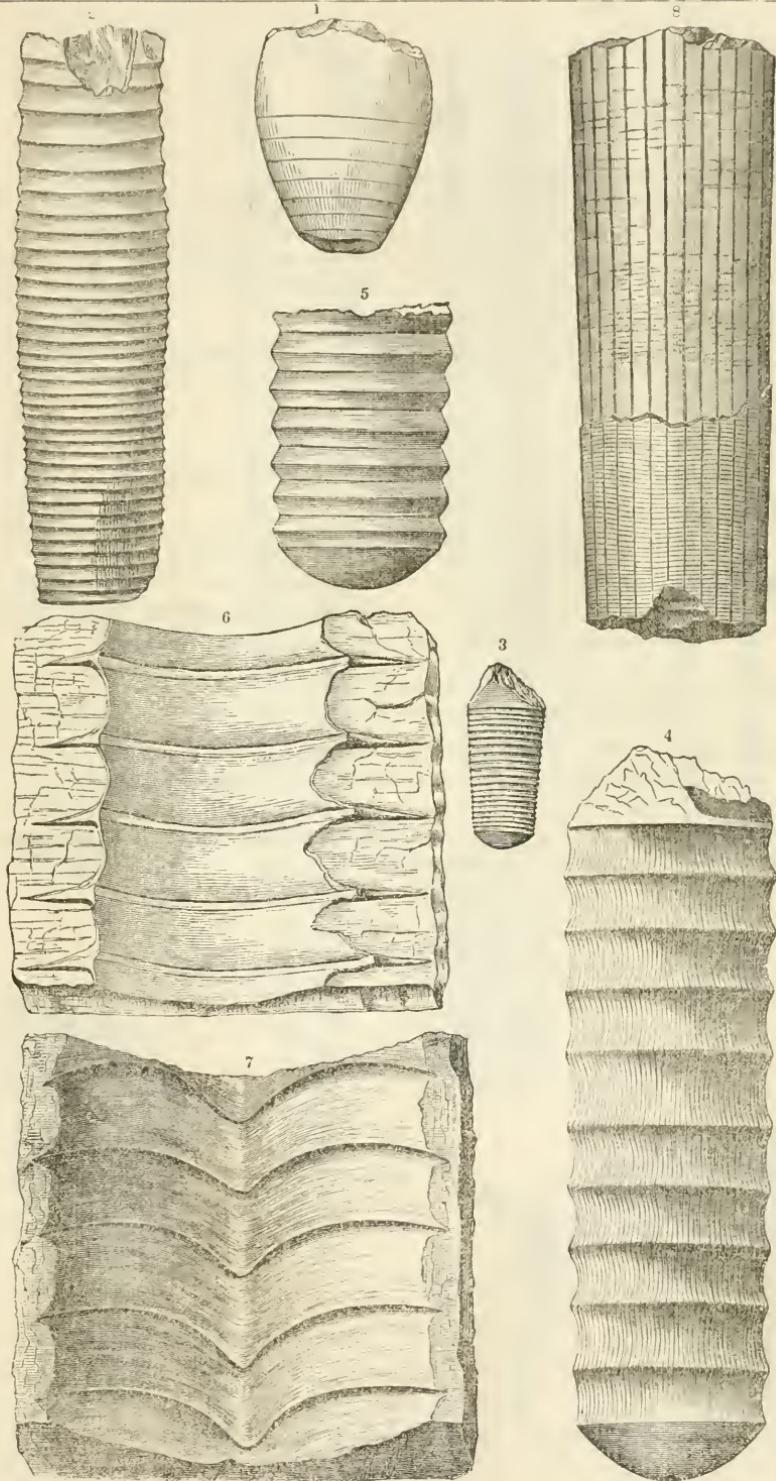


PLATE 8.

Fig. 1 & 2. ORTHOCERAS CROTALUM.

Fifteenth Report on the State Cabinet, p. 78; Appendix C cont. p. 50.

Fig. 1 represents the ordinary form and condition of the specimens.

Fig. 2, a variety of the preceding, or perhaps a distinct species, having the direction of the septa and the annulations not coincident.

Fig. 3 & 4. ORTHOCERAS NUNTIUM.

Fifteenth Report on the State Cabinet, p. 79; Appendix C cont. p. 51.

Fig. 3, a cast of an imperfect individual; 4, a fragment preserving the surface markings.

Fig. 5. ORTHOCERAS EXILE.

Fifteenth Report on the State Cabinet, p. 78; Appendix C cont. p. 50.

Fig. 6. ORTHOCERAS BACULUM.

Fifteenth Report on the State Cabinet, p. 74; Appendix C cont. p. 46.

Fig. 7. ORTHOCERAS EMACERATUM. A species resembling *O. exile*; but the septa are proportionally much more distant, there being three in this one in the space of four in the preceding*.

Fig. 8. GOMPHOCERAS (APIOCERAS) CONRADI.

Thirteenth Report on the State Cabinet, p. 106.

Fig. 9. APLOCERAS (CYRTOCERAS) LIRATUM.

Fifteenth Report on the State Cabinet, p. 72; Appendix C cont. p. 44.

* The description of this species should follow that of *O. exile*, p. 78 of this Report (p. 60 Appendix C, 1861); it having been accidentally omitted.

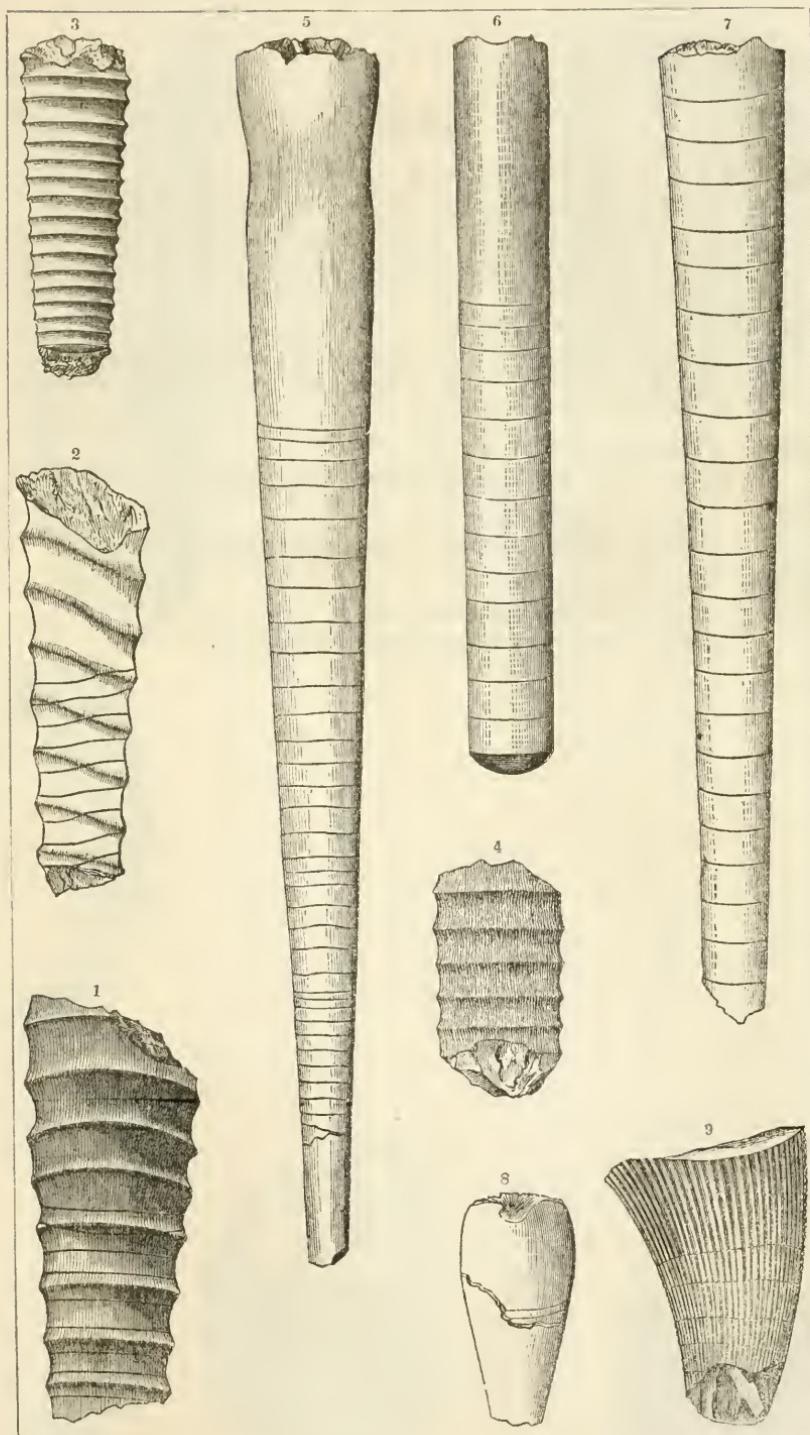


PLATE 9.

Fig. 1, 2 & 3. CYRTOCERAS EUGENIUM.

Fifteenth Report on the State Cabinet, p. 70; Appendix C cont. p. 42.

Fig. 1, outline of the form; 2, a fragment (dorsal view) preserving a part of the shell, and showing the lines of septa; 3, a portion of the shell near the aperture, showing the sinus in the anterior margin.

Fig. 4 & 5. GYROCERAS NEECUS.

Fifteenth Report on the State Cabinet, p. 67; Appendix C cont. p. 39.

Fig. 4, outline of an imperfect specimen; 5, illustrating the character of the lamelloose surface.

Fig. 6. CYRTOCERAS MORSUM.

Fifteenth Report on the State Cabinet, p. 71; Appendix C cont. p. 43.

Fig. 7. CYRTOCERAS METULA.

Fifteenth Report on the State Cabinet, p. 72; Appendix C cont. p. 44.

Fig. 8. TROCHOCERAS CLIO.

Fourteenth Report on the State Cabinet, p. 108.

Fig. 8, view of the lower side of an imperfect specimen.

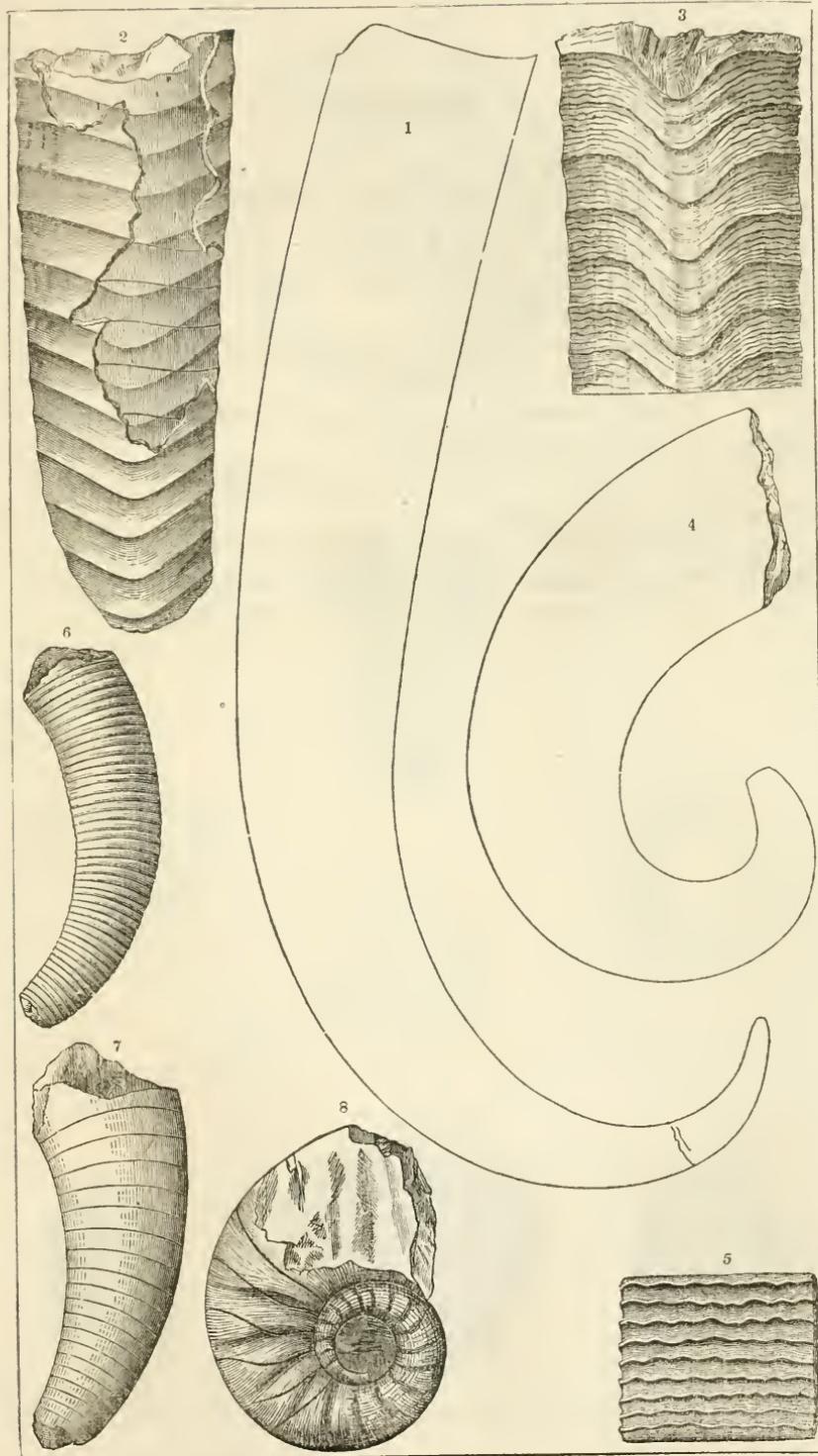


PLATE 10.

Fig. 1. *CLYMENIA ERATO.*

Fifteenth Report of the Regents on the State Cabinet, p. 64; Appendix C continued, 1861, p. 36.

Fig. 2 - 5. *CALYMENE CHRISTYI.*

Thirteenth Report on the State Cabinet, p. 118.

Fig. 6. *PROETUS HALDEMANI.*

Fifteenth Report on the State Cabinet, p. 102; Appendix C cont. p. 74.

Fig. 7 - 9. *PROETUS LONGICAUDUS.*

Fifteenth Report on the State Cabinet, p. 108; Appendix C cont. p. 80.

Fig. 10. *PROETUS CRASSIMARGINATUS.*

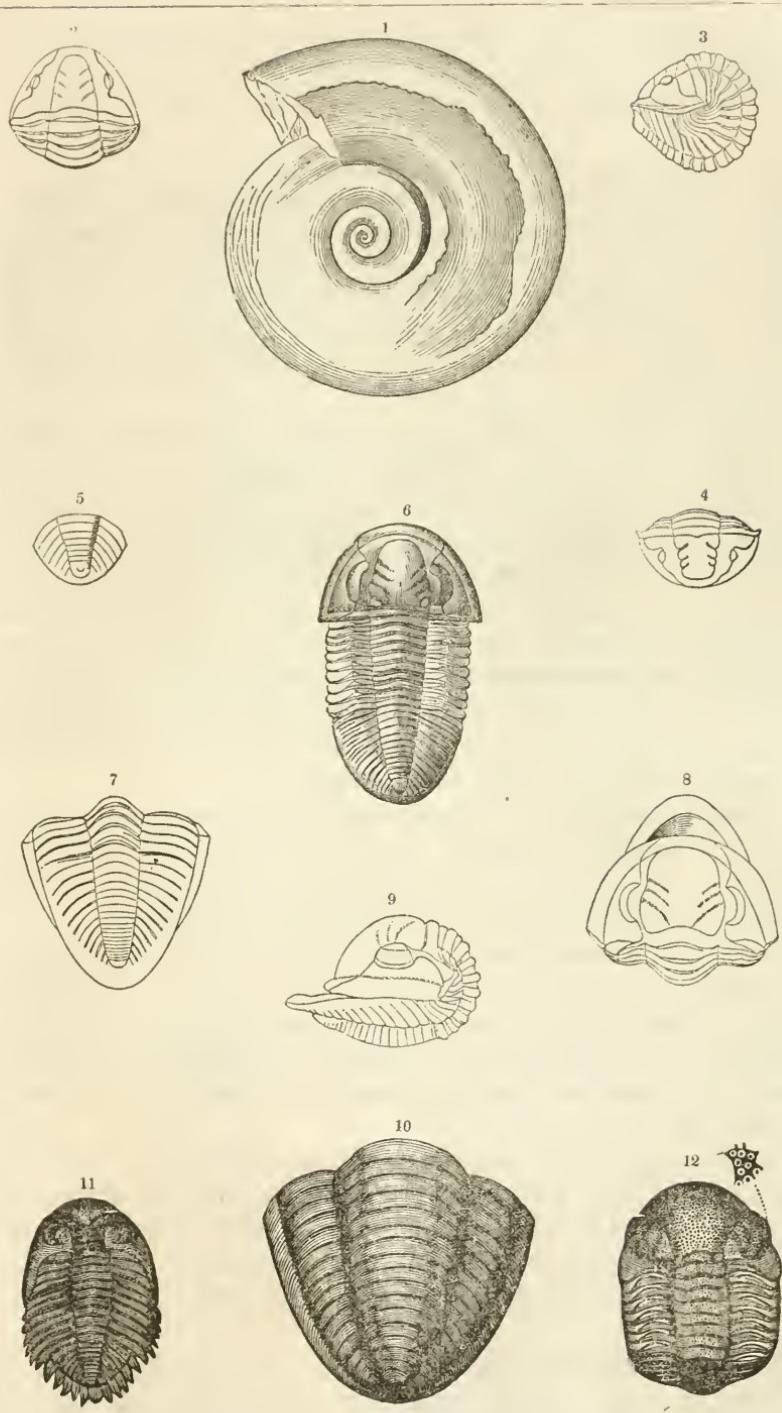
Fifteenth Report on the State Cabinet, p. 100; Appendix C cont. p. 72.

Fig. 11. *DAIMANIA BOOTHI.*

Fifteenth Report on the State Cabinet, p. 91; Appendix C cont. p. 63.

Fig. 12. *PHACOPS RANA* (= *PHACOPS BUFO*, var. *RANA* : GREEN).

Fifteenth Report on the State Cabinet, p. 93; Appendix C cont. p. 65.



NOTICE.

IN the Thirteenth Report of the Regents on the Cabinet of Natural History, 1860, I presented the results of some investigations upon certain genera of Brachiopoda, made at intervals in the course of the two preceding years. This Report was mainly printed during my absence; and the observations upon the Genera ATHYRIS (= SPIRIGERA), MERISTA, CAMARIUM and MERISTELLA were printed according to the accompanying text.

Having taken one of the types of MERISTA as indicated by Mr. DAVIDSON (the *M. (Atrypa) tumida* of DALMAN) as a guide in determining the characters of the genus, I had previously separated certain forms, with a transverse septum in the interior of the ventral valve, under the generic name of CAMARIUM. Being in correspondence with Mr. DAVIDSON, I had stated to him the grounds of my proposed separation of the genera; and it was only on my return to Albany in the early part of November, that I found a letter from that gentleman, in which he says, that since the typical species of SUESS do possess "the shoelifter process," the name MERISTA must be retained for those having that character.

Although the figures of MERISTA given by DAVIDSON in his work are not as distinctive as could be desired in regard to this arching septum or shoelifter process, I nevertheless became satisfied that my proposed Genus CAMARIUM was identical with MERISTA.

On inquiry, I found that the Report had not been published, but was waiting for the plates of the first part; and, desirous of making the correction as early as practicable and as complete as possible, I procured the reprinting of a few pages, introducing the requisite changes, in preference to adding a postscript, or waiting for the next Annual Report.

It would appear that a copy of these first printed sheets fell into the hands of Prof. B. SILLIMAN JR., and were made the subject of criticism in the American Journal of Science; the writer expressing great solicitude in reference to the changes made, and proffering advice to the Regents in regard to the "original text" of their Reports.

Having retained no copy of the sheets myself, I requested, through a friend, that Mr. SILLIMAN would allow me the use of his copy of the pages for publication, which was refused; and it was only after

several months that I became aware of the existence of another copy in the hands of Mr. PATERSON, and I here communicate a reprint of it, in order that the scientific world may know what was originally printed.

At the same time, some additional matter, the results of previous studies, was added to the Report; in regard to which, that there might be no misapprehension, I sent a note to the printer, to be inserted at the end, stating that additions had been made during 1860*. To honest minds, there could be no difficulty in appreciating my motive for appending that notice. I could gain nothing *in time* by adding this new matter to the Report : I could as well have printed and circulated it separately, and with the date of publication. There is no antedating, nor attempt at antedating : the Report was published in December, 1860. The delay in publication was due simply to the non-completion of the engraving of plates belonging to the preceding part of the Report; and this gave me an opportunity of making the corrections, and adding other matter.

* I was subsequently informed by the printer that this note did not reach him till the last form was in press, and consequently it does not appear in some of the first impressions.

OBSERVATIONS ON THE GENERA *ATHYRIS* (= *SPIRIGERA*),
MERISTA, *CAMARIUM* AND *MERISTELLA*.

AMONG the fossils referred for many years to *TEREBRATULA*, *ATRYPA*, etc., European authors have separated the Genera *SPIRIGERA* and *MERISTA*; shells which have many characters in common, and which were indeed at first united under *SPIRIGERA* or *ATHYRIS*, until in 1851 the Genus *MERISTA* was proposed by Prof. SUESS. In my later studies of the Brachiopoda of the American palæozoic strata, I have referred to the Genus *SPIRIGERA* certain species which have a subglobose or ovoid form, with lamellose surfaces and without, or with scarcely perceptible radiating striae; while other forms, which are less distinctly lamellose and always more or less distinctly radiating striae with fine concentric lines of growth, I have referred to the Genus *MERISTA*. Many of the latter have the general form and surface-characters of *Merista* (*Atrypa*) *tumida*, DALMAN, but are less ventricose: they all have internal spires, and, when perfect, the beaks appear to be imperforate. The radiating striae, though visible in well-preserved specimens, are still more conspicuous in the partially exfoliated shell.

I proposed last year* a separation of certain Merista-like forms, under the name *CAMARIUM*, on account of the presence of an arching transverse septum in the ventral valve. Subsequently, a more careful consideration of the characters of *MERISTA* as given by Mr. DAVIDSON, and an inspection of his figures, have shown me that this arching septum, in its attenuation towards the beak, is identical with the shoelifter process described as belonging to the Genus *MERISTA*. An examination of numerous specimens of different species of those which I have referred to the Genus *MERISTA*, shows no evidence of this process or septum; and the deep muscular impression below the rostral cavity, and the thickening of this part of the shell, are characters incompatible with the existence of the septum. Moreover I conceive that this arching septum, or the extension of the shoelifter process into the cavity of the valve, would produce such a modification of the soft parts of the animal, that the inhabitants of these shells were generically distinct from the inhabitants of the large uninterrupted cavity of the shells which I have referred to *MERISTA*.

In order, if possible, to reach a solution of the question, I have had the shell removed from a solid specimen of *M. tumida*†, which is one of the types of the genus, and there is certainly no evidence of the septum or shoelifter process, but, on the contrary, the presence of all the characters marking the American species which I have referred to *MERISTA* in Vol. iii, Pal. New-York. At the same time, the *Merista* (*Terebratula*) *scalprum* of BARRANDE, in the most solid of the specimens which I possess, readily reveals the presence of the septum.

Since, therefore, the *Merista tumida* (DALMAN) and *M. herculea* (BARRANDE) are made the types of the Genus *MERISTA*‡, and the external and internal cha-

* In the Thirteenth Report of the Regents on the State Cabinet: Also Supplement to Vol. iii, Pal. N.York.

† A specimen from Dudley, England, which does not differ materially from an authentic Swedish specimen; and Prof. M'Coy has pronounced the Swedish and Dudley specimens identical.

‡ In my original observations upon the Genus *CAMARIUM*, I had supposed that the presence of the strong arching septum in the ventral valve might be incompatible with the existence of internal spires; but since these spires do exist in *M. scalprum*, I can have no hesitation in crediting their existence in our *CAMARIUM*.

racters of these are common to numerous well-marked forms in our Silurian strata which show no evidence of the septum described, I advocate the restriction of the generic designation to species of that type. At the same time, believing as I do that the characters shown in the valves of *CAMARIUM* are incompatible with an animal like that inhabiting *MERISTA*, I feel compelled to advocate the separation of these forms, and to maintain the Genus *CAMARIUM*, adding, to the characters first given, that it contains internal spires* as in *MERISTA* and *SPIRIGERA*.

With this restriction, the Meristæ proper consist of smooth, ovoid, circular or transverse shells, with usually a conspicuous sinus upon the ventral valve, and a corresponding wide mesial fold or elevation upon the dorsal valve. The hinge articulation is not very different from that of *SPIRIGERA*, to which they are allied; but those which I have regarded as true Meristæ have a deeply marked triangular muscular area just below the rostral cavity of the ventral valve, which is bordered on the anterior side by a callosity of the shell, and on the other two sides by the strong dental lamellæ. This feature is not conspicuous in *SPIRIGERA*: the dental lamellæ in that genus are shorter and less strong, and the form of the muscular impression is different. The dorsal valve of *MERISTA* has a longitudinal median septum; a feature which is obsolete, or partially obsolete, in the species of *SPIRIGERA*. The species of *CAMARIUM* have the external form of *MERISTA*, but the wide transverse arching septum in the ventral valve serves to distinguish it from *MERISTA* or *SPIRIGERA*.

The Meristæ begin their existence, so far as we know, in the rocks of the Clinton group; and in this and the Niagara group there are several species, while they are more numerous in the Lower Helderberg group: they occur likewise in the Upper Helderberg rocks, and in the Hamilton group. *CAMARIUM* appears first in the Lower Helderberg period, while *SPIRIGERA* is known in a single species for the first time in the Hamilton group.

In the period of the Hamilton group, other new forms appear, apparently allied to *MERISTA*, but marked by plications on the mesial fold and sinus, and sometimes with obscure or distinct plications on the lateral portions of the shell.

The internal structure appears to be the same as in *MERISTA*, and the fine obscure radiating striae and fine cancellating concentric lines appear both upon the surface and upon the exfoliated shell. In these forms the substance of the shell is always thin, and the individuals are never so gibbous as in the species of the three allied genera.

Some of these forms approach *RHYNCHONELLA*; but the plications are more rounded, and rarely or never continued to the lateral margins, which are more compressed than in *RHYNCHONELLA* proper. The internal structure appears, so far as ascertained, to be the same as in *MERISTA*.

For these forms, I propose the generic name *MERISTELLA*.

GENUS *MERISTELLA* (n. g.).

SHELLS variable in form, ovoid, circular or transverse: valves more or less equally convex, with a median sinus upon the ventral valve and a corresponding elevation upon the dorsal valve; beaks imperforate, that of the ventral valve curving over the smaller valve. Surface more or less strongly plicated; the mesial fold and sinus always plicated, the lateral portions being sometimes nearly or quite free from plications; concentrically marked by fine lines of growth and some stronger imbricating lamellæ. Substance of shell thin: structure distinctly

* I have not seen the original description of this genus by Prof. EUESS.

fibrous. Valves articulating by teeth and sockets. Interior of ventral valve with two short diverging dental lamellæ, which extend into and are affixed to the sides or bottom of the rostral cavity. The muscular impressions occupy a narrow triangular cavity below the bases of the lamellæ, and usually extend about one-third the length of the shell. Dorsal valve with a well-defined median septum, which extends half the length of the shell: the hinge-plates are narrow and strong processes, embraced by the curving teeth of the opposite valve.

In numerous specimens examined, there is no evidence of internal spires; and it is only the similarity of these forms to *MERISTA* and *SPIRIGERA*, that affords an argument in favor of the existence of these appendages.

The types of this genus are *Atrypa quadricosta* and *A. mesacostalis* (HALL, Geol. Report of the Fourth District of New-York = *Meristella quadricosta* and *M. multicosta* described in this paper, from the shales of the Hamilton group.

The following figures will serve to illustrate more fully the characters and differences of these genera, as given above.

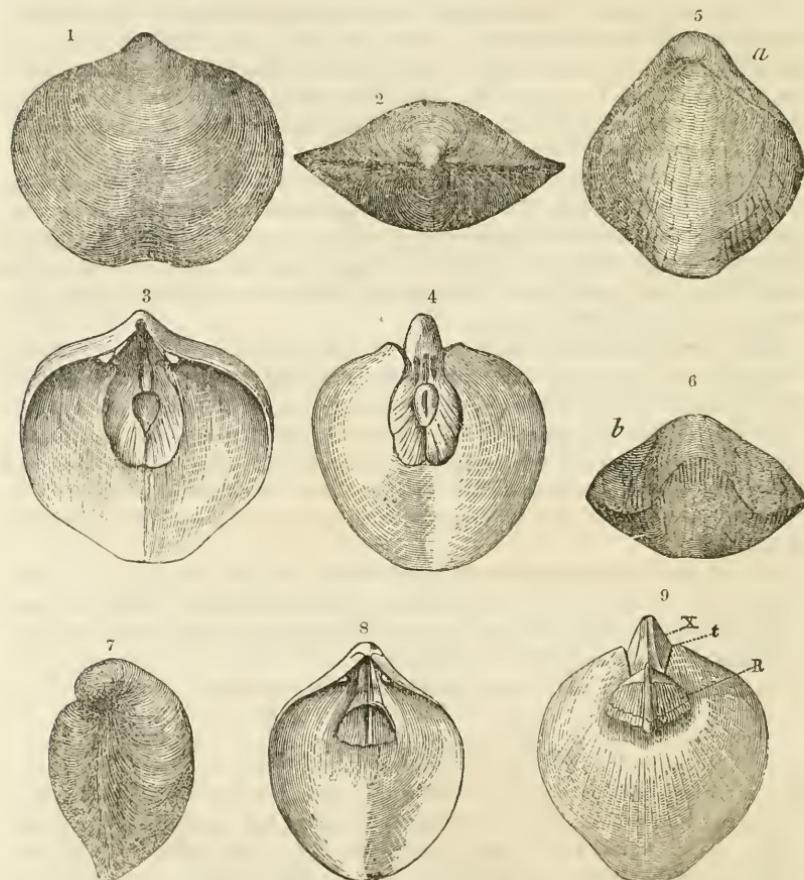


FIG. 1 & 2 are of the exterior, and 3, 4 the interior and east of *Athyris spiriferoides* from the Hamilton group, N.York.

FIG. 5, 6 & 7 : Dorsal, front and profile views of *Merista princeps* of the Lower Helderberg. 8, 9 are the interior and east of the ventral valve as shown in a species of the age of the Upper Helderberg limestones, Ohio : the letter *X* refers to the filling of rostral cavity; *t*, the cavities of the dental lamella; *R*, the triangular muscular impression.

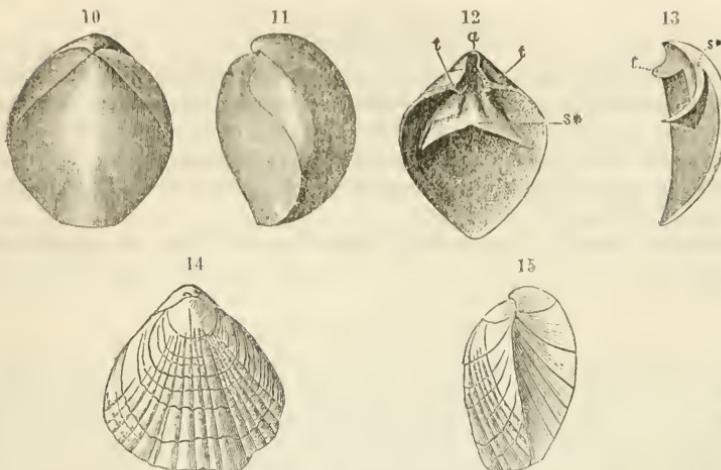


FIG. 10 & 11. Dorsal and profile views of *Camarium typum*: 12, interior of the ventral valve; 13, longitudinal section; *a*, rostral cavity; *s*, transverse arching septum, or "shoe-litter" process of KING; *t*, teeth.

FIG. 14 & 15 illustrate the exterior form and characters of *Meristella multicosta* of the Hamilton group, and may be considered as illustrating the general external characters of the genus.

DESCRIPTIONS OF NEW SPECIES OF FOSSILS,

CHIEFLY FROM THE HAMILTON GROUP OF WESTERN NEW-YORK.

LINGULA LIGEA (n.s.).

SHELL narrow elliptical; length equal to twice the width; sides regularly curving; extremities subequal; margins of the valves thickened. Surface marked by fine concentric striae, and by a few obscure or obsolete radiating striae. The more convex valve shows, along the inner margin, a narrow shallow groove as if the edge of the opposite valve closed just within its margin.

The shell is of more equal width throughout and more symmetrically oval, and is much larger than the *L. spatulata* of the Genesee slate.

Geological formation and locality. In the shales of the upper part of the Hamilton group, on the shore of Seneca lake; and near the base of the Portage group, at the falls below Trumansburgh, N.York.

LINGULA PALÆFORMIS (n.s.).

SHELL broadly subovate, convex at the umbo and depressed below, the length a little greater than the greatest width, rapidly expanding for about two-thirds the length of the shell, below which it is abruptly rounded: shell thick. Surface marked by strong concentric lamellose striae, and, in the exfoliated surface, by fine radiating striae.

Geological formation and locality. In the shales of the Hamilton group, associated with numerous known fossils, in a loose fragment of rock in the valley south of Cayuga lake.

LINGULA EXILIS (n.s.).

SHELL broad ovate, moderately convex, length little greater than width; apex obtuse; cardinal margin obtusely rounded; sides regularly curving; base broadly rounded. Surface lamellose with irregular rugæ or lines of growth.

This species is very broad; and the great width at the apex, and broadly rounded cardinal extremity, distinguish it among all the other forms of the Hamilton group or of the rocks of New-York.

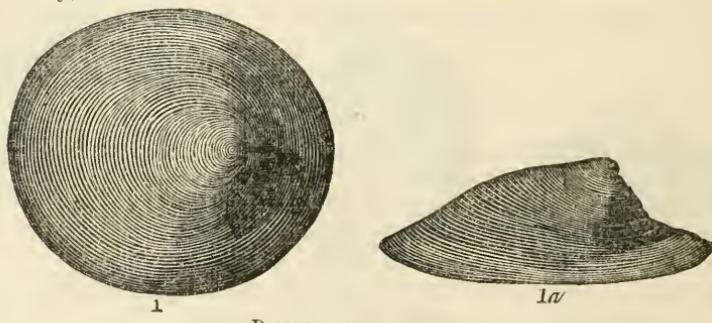
Geological formation and locality. In the Marcellus shale, near Bridgewater, New-York.

DISCINA ALLEGHANIA (n.s.).

SHELL broadly elliptical or nearly circular. Dorsal valve depressed conical; anterior side broadly and equally convex; apex placed at a little more than one-third the length from the posterior end of the shell, slightly inclined backwards; the posterior slope concave, and the shell flattened towards the margin. Surface marked by fine regular concentric lamellæ, which are distant from each other two or three times their width.

This large species is one of the finest and most beautiful of the genus, nearly equal in size to the *Discina grandis* of the Oriskany sandstone, and differing from that one in the posterior position of the apex and the more abrupt sloping on the posterior side, while the concentric striae are much finer and more closely arranged. It differs from the large circular form *Discina discus* of the Lower Helderberg group, in the greater elevation of the dorsal valve, and absence of radiating striae.

Geological formation and locality. In the Chemung group, Hobieville, Allegany county, New-York.



DISCINA ALLEGHANIA.

CRANIA HAMILTONIÆ (n.s.).

SHELL subconical, subcircular; apex subcentral, pointed in well-preserved specimens, often worn or decorticated. Exterior surface of the dorsal or upper valve lamellose. Ventral or lower valve marked by four strong muscular impressions, which are variable in form: the two lateral ones are distant, and each apparently double; the central impressions approximate, diverging above and assuming a somewhat cordiform appearance; vascular impressions strongly digitate.

This species is found adhering to valves of *Tropidoleptus*, *Strophodonta*, *Spirifer*, *Spirigera*, *Avicula*, *Orthoceras*; and the separated valves are free in the shales.

Geological formation and localities. In the shales of the Hamilton group: Western New-York, Maryland, and Virginia.

CRANIA CRENISTRIATA (n.s.).

VENTRAL or upper valve very depressed conical, subcircular in outline; apex central or subcentral, a little inclined. Surface marked by sharp elevated crenulate striae reaching almost to the apex (which is quite smooth), and increasing by interstitial additions.

This species is quite rare, and two specimens only of the ventral valve are known at this time. The sharp elevated striae give the fossil, when partially obscured by adhering shale, the appearance of the exterior of the small funnelshaped fronds of *FENESTELLA*.

Geological formation and locality. In shales of the Hamilton group, Ontario county, N.York.

CRANIA LEONI (n.s.).

SHELL subcircular, transverse or slightly elongate. Dorsal valve convex : ventral valve concave, variable in form. The shell, towards the margin, is more abruptly recurved : hinge-line straight, equal to a little more than one-third the width of the shell. Muscular impressions of the posterior adductors in the dorsal valve near the cardinal angles; the anterior ones near together and a little behind the centre, with two minute impressions a little anterior to the centre, marking the place of the retractor muscles. Ventral valve with the posterior adductors corresponding to those of the dorsal valve; the anterior adductors occupying a subcircular area, and barely separated by an elevation marking the place of the protractor muscle.

This species is known only in the condition of casts of the interior. The dorsal side is moderately convex; the apex apparently a little excentric on the posterior side.

Geological formation and locality. In the Chemung group: Leon, Cattaraugus county, N.York.

ORTHIS LEPIDUS (n.s.).

SHELL small, transversely subelliptical, somewhat ventricose : cardinal line little less than the greatest width of the shell; area proportionally large; beaks distant. Ventral valve very convex, regularly curved from beak to base : beak prominent, pointed, slightly incurved. Dorsal valve depressed convex, marked by a distinct mesial depression, which, in some specimens, extends nearly to the beak : beak small, pointed, and but little incurved. Surface marked by fine radiating striae, crossed by concentric striae and a few lines of growth.

This is the smallest species of *ORTHIS* yet known in the Hamilton rock of this country, and is easily characterized by the great transverse diameter, the proportionally large area, the prominent beak of the ventral valve, and the distinct sinus of the dorsal valve.

Geological formation and locality. In shales of the Hamilton group : Ontario county, N.York.

ORTHIS CYCLAS (n.s.).

SHELL small, varying from subcircular to transversely subelliptical, moderately convex : beaks appressed, not distant; cardinal line rather less than one-half the greatest width of the shell. Ventral valve convex, most gibbous near the umbo : beak small, slightly incurved; area rather low. Dorsal valve the less convex, sometimes marked by a shallow depression : beak very small, slightly projecting beyond the cardinal line; area small. Surface marked by strong sharp

prominent striae, which are both bifurcated and implanted, often appearing fasciculate near the margin of the shell.

The largest specimens known of this species measure not more than three-eighths of an inch in the greatest diameter. The distinguishing features are the coarse prominent striae and the length of the cardinal line.

Geological formation and locality. Shales of the Hamilton group : Western New-York.

ORTHIS PENELOPE (n. s.).

SHELL large, oblate, the proportions of length and breadth usually as four to five, plano-convex : hinge-line about two-fifths of the breadth of the shell. Ventral valve flat or slightly convex : beak somewhat elevated; foramen broad, triangular. Dorsal valve regularly convex, with a very slight depression : beak small, rising but little beyond the general outline of the shell; area smaller than that of the opposite valve.

Surface marked by fine radiating bifurcating striae, which are strongly arched upwards near the cardinal extremities, and crossed by fine concentric striae, giving a slightly rugose appearance in well-preserved specimens; and, besides these, are closely arranged lamellolose lines of growth. The radiating striae have the appearance of being broken, from the peculiar manner in which the pores open upon the surface.

Interior of the ventral valve marked by a subcircular foliate muscular impression, which occupies more than half the length and breadth of the valve, and, in old specimens, is extremely thickened from its anterior margin nearly to the border of the palpal impression. Interior of the dorsal valve marked, in old specimens, by a similar imprint, but smaller and less distinctly defined. The cardinal and brachial processes are strong and prominent, directed downwards into the opposite valve : the cardinal process fills the broad foramen of the ventral valve, and appears as an angular ridge on the exterior of the area.

This species is much larger than *O. vanuxemi*, with which it is associated; often measuring more than one and three-quarters inches in transverse diameter, while the largest specimens of *O. vanuxemi* seldom measure more than one inch. It differs also in the character and strength of the radiating striae; the muscular imprint of the ventral valve is usually broader and more strongly marked; the cardinal and brachial processes of the dorsal valve are stronger, and directed towards the opposite valve, while those of *O. vanuxemi* are inclined forward or into the cavity of the dorsal valve.

Geological formation and locality. Shales of the Hamilton group : Western New-York.

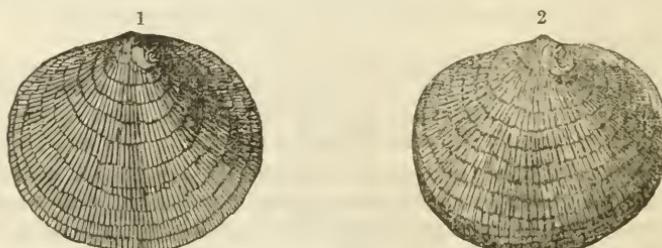


FIG. 1 & 2. Dorsal and ventral valves of *Orthis penelope*. One of these figures was used in the Regents' Report of 1847, to illustrate *Orthis vanuxemi*, with which this species was at that time included.

ORTHIS LEUCOSIA (n.s.).

SHELL broad ovate, greatest breadth below the middle, obtusely pointed at the beaks. Valves moderately convex : cardinal area short and small; beaks approximate, pointed and incurved. Ventral valve depressed convex, most gibbous at the umbo and flattened towards the front, without a distinct mesial sinus, but sometimes having a broad shallow curve at the anterior margin of the shell : foramen broad triangular. Dorsal valve much the more gibbous, the greatest convexity above the middle, marked along the middle by a very slight depression which is sometimes obsolete : area smaller than that of the opposite valve, curved and slightly overhanging. Surface marked by fine radiating bifurcating striae, crossed by strong distant lamellose lines of growth, and interrupted by the openings of the pores. Interior of ventral valve marked by a strong, foliate, somewhat elongate muscular impression.

This species is allied to *O. vanuxemi*, but differs in the cardinal margin being nearly straight from the beaks to nearly one-third the length of the shell, while in that species it is usually regularly curved : it differs also in the area being much smaller, and the beaks incurved and closely approximate.

Geological formation and locality. Shales of the Hamilton group : Ontario county, N.York.

ORTHIS SOLITARIA (n.s.).

SHELL small, subcircular or broadly ovate : valves unequally convex; hinge-line somewhat more than one-half the greatest width of the shell. Ventral valve highly convex : beak small, prominent, slightly incurved; area low and well defined. Dorsal valve depressed convex, most prominent near the umbo; a broad shallow mesial sinus at the anterior margin, which does not extend beyond the middle of the shell : beak small, not prominent; area linear. Surface marked by fine radiating bifurcating striae and strong concentric lines of growth.

This shell is of the type of *O. elegantula*. It differs from any other in the Hamilton group, except *O. lepidus*, in having the ventral valve more convex than the dorsal, the sinus being on the dorsal valve. From *O. lepidus* it differs in being longer than wide, with less prominent beak and smaller area : it is also a larger species, being more than half an inch in diameter.

Geological formation and locality. Shales of the Hamilton group : Livingston county, N.York.

ORTHISINA ARCTOSTRIATA (n.s.).

SHELL small, semicircular or semielliptical : hinge-line straight, nearly equal to the greatest width of the shell. Ventral valve irregularly gibbous : beak small, pointed, and truncate from its adhesion to foreign substances; area moderate, slightly arcuate, and somewhat irregular on the two sides; pseudo-deltidium broadly triangular, closed. Dorsal valve depressed convex; area narrow linear. Surface marked by strong sharp close radiating crenulated striae, which increase by interstitial addition, and crossed by strong concentric lines of growth.

Geological formation and locality. Shales of the Hamilton group : Ontario county, N.York.

1



ORTHISINA ARCTOSTRIATA.

FIG. 1. Ventral view of a medium-sized specimen.

FIG. 2. Enlarged cardinal view of another specimen, showing the closed rounded pseudo-deltidium.

ORTHISINA ALTERNATA (n.s.).

SHELL of medium size, semielliptical : hinge-line shorter than the greatest width of the shell; cardinal extremities rounded. Ventral valve most gibbous near theumbo and depressed near the front : area moderate, somewhat arcuate; pseudo-deltidium large, broad at base, imperforate, marked along the middle by a deeply impressed line. Dorsal valve regularly convex, apparently without sinus; area linear or obsolete. Surface marked by fine radiating striae, alternating in size, usually three smaller between the larger ones near the margin of the shell; distinctly undulating concentric striae. The margin of the shell is extremely thin.

This species differs from the last in the proportionally shorter hinge-line and the alternating larger and smaller striae, which are also less prominent and less closely arranged.

Geological formation and locality. Shales of the Hamilton group : Genesee county, N.York.

1



ORTHISINA ALTERNATA.

FIG. 1. Dorsal valve of a small individual.

2



FIG. 2. Dorsal valve of a larger individual.

AMBOCÆLIA GREGARIA (n.s.).

Compare with *Atrypa unguiculus*, SOWERBY, Geol. Transactions, Vol. v, pl. 54, f. 8.

Spirifer unguiculus, PHILLIPS, Pal. Fossils, pl. 28, f. 119.

Orthis unguiculus, HALL, Geol. Report Fourth District of New-York, p. 268, f. 5 a, b, c, d; p. 267.

SHELL subhemispherical, wider than long : hinge-line straight; cardinal angles rounded. Ventral valve gibbous, marked by a shallow mesial sinus, which extends from near the beak to the base of the shell: beak obtuse, strongly incurved. Dorsal valve semielliptical, depressed convex, with sometimes a slight longitudinal central depression; foveal plates slender and parallel.

This species differs from *A. umbonata* in the less regular convexity of the ventral valve, the greater convexity of the dorsal valve, and the proportionally greater transverse diameter.

I had originally considered this shell as identical with *Atrypa unguicula* (SOWERBY), *Spirifer unguiculus* (PHILLIPS), placing it under the Genus *ORTHIS*; but farther comparison of figures and descriptions has convinced me that it is quite distinct.

A variety (*A. crassa*), which has not thus far afforded the means of separation as a distinct species, has the bases of the dental lamellæ thickened, and extended in strong ridges across the valve on each side obliquely to the anterior lateral margins, leaving the central part of the shell of the ordinary thickness.

Geological formation and locality. In shaly sandstone of the Chemung group, crowded together in great numbers in some beds : Paintedpost, Jasper, Steuben county; near Ithaca in Tompkins county, and in Chautauque county.

VITULINA PUSTULOSA (n.s.).

SHELL plano-convex, semicircular : hinge-line equal or nearly equal to the greatest width of the shell; area large, triangular, reaching to the extremities of the cardinal line. Ventral valve highly convex, the greatest convexity at the umbo : beak small, pointed, somewhat incurved over the area; foramen very broad, equalling half the length of the cardinal line. Dorsal valve flat or slightly convex, having a broad shallow sinus, flat or with an incipient fold in the bottom. Surface marked by about ten moderately strong simple rounded radiating plications, two of which are slightly elevated in the middle of the ventral valve, in form of a mesial fold corresponding to the sinus of the dorsal valve; the entire surface beautifully covered with minute pustules resembling spine-bases.

Geological formation and locality. In the limestone of the upper part of the Hamilton group : Genesee county, N.York.

SPIRIFER VENUSTUS (n.s.).

SHELL subrhomboidal, ventricose, length about two-thirds the greatest width : hinge-line scarcely equalling the greatest width of the shell; cardinal extremities rounded. Dorsal valve very convex; mesial fold narrow above and expanded in front. Ventral valve less convex than the opposite, broadly arching from the extremities, the greatest convexity a little above the middle : beak arched; area short, rounded, and not defined at the margins; foramen high, the height equal to the width at the base; mesial sinus narrow and well defined near the beak, broader below the middle and expanded in front, terminating in a broad triangular extension. Surface marked by numerous fine bifurcating plications, the mesial sinus margined by a stronger plication; at the beak there is a single one in the centre which sometimes continues simple to the base, while the accessions take place from the lateral ones, till there are 10, 11, or 12 within the limits of the sinus near the base : plications crossed by arching lamellose striæ, which are granulose or fimbriate on the margins.

This is one of the finest species of *SPIRIFER* in the Hamilton group, and equal or superior in size and beauty to *S. granulifera*. It is the only species in this group which has bifurcated plications, or plications on the mesial fold and sinus. The largest specimen is about three inches wide, by nearly two inches long. In general aspect and surface characters, this species resembles the finer specimens of *S. cameratus*.

Geological formation and locality. Shales of the Hamilton group : Livingston county, N.York.

TREMATOSPIRA GIBBOSA (n.s.).

SHELL transversely subelliptical, once and a half as wide as long, ventricose, the anterior margin thickened in old specimens; valves subequally convex. Beak of

ventral valve strongly arcuate, and truncated by a circular perforation which is completed on the inner side by the outer ends of the small deltidial plates; false area small, broad triangular. Beak of the dorsal valve abruptly incurved, and concealed by passing within the concavity of the area of the opposite valve. Surface marked by nine strong angular elevated plications; three in the centre of the dorsal valve more approximate, giving the appearance of a mesial elevation, and three correspondingly depressed on the ventral valve: concentric lamellae of growth at irregular distances, undulated in crossing the plications, give a series of zigzag lines. Entire surface finely granulose. Shell-structure strongly punctate. This species differs from every other described, in its extreme gibbosity and highly elevated angular plications.

Geological formation and locality. Shales of the Hamilton group : Western New-York.

RHYNCHOSPIRA NOBILIS (n.s.).

SHELL large, broadly subovoid, ventricose. Dorsal valve the more gibbous, with a broad moderately elevated mesial lobe. Ventral valve with a broad mesial sinus: the beak large and truncated by a large round foramen, the lower side of which is bounded by the summits of the deltidial plates: margins of the valve subulate a little below the beak. Surface marked by numerous angular elevated plications, which are sharply crenulated on the summits; the sides and intermediate spaces finely and evenly striated. In the mesial fold there are from nine to eleven plications elevated, and a corresponding number in the sinus of the opposite valve.

The dorsal valve shows strong crural processes extending from the hinge-line for a short distance, when they become slender and flattened, and below this they curve and send off a process towards the centre of the shell, as in others of the genus, and similar to that of *TEREBRATULA*.

This is the largest species of *RHYNCHOSPIRA* now known. It differs conspicuously from the other species, in the defined mesial fold and sinus, and sharply elevated plications.

Geological formation and locality. Hamilton group : Livingston and Erie counties.

RHYNCHOSPIRA LEPIDA (n.s.).

SHELL small, broadly suboval. Ventral valve depressed convex, regularly arched from beak to base: beak prominent, pointed, slightly incurved, foramen triangular, closed by two convex deltidial plates which are excavated on their inner and upper margins, forming an elongate or oval perforation. Dorsal valve the less convex, most gibbous above the centre. Surface marked by about twenty-four fine simple radiating plications; five in the middle of the valves stronger, distinctly elevated on the ventral valve. These stronger plications extend, giving a protruding form to the front of the shell.

This species differs from the others of this genus, in the flatness of the valves, fineness of the plications, and general form.

Geological formation and locality. Shales of the Hamilton group : Ontario county.

ATRYPA PSEUDOMARGINALIS (n.s.).

SHELL trilobate, subcircular, with the beak of the ventral valve extended. Dorsal valve with mesial fold strongly defined below the first third of the shell, and elevated in front. The mesial sinus does not extend to the beak. Plications rounded, irregularly bifurcating.

This species resembles *Atrypa marginalis* of DALMAN, but is larger and more robust, the beak less attenuate, the mesial fold and sinus broader and not extending to the beak, and the striae coarser and not as much recurved. From the Bohemian specimens under the same name, it differs in the greater elevation and rounded form of the mesial lobe, and the less angular plications.

Geological formation and locality. Upper Helderberg limestone : Schoharie.

MERISTA HASKINI (n.s.).

SHELL broadly ovate, more or less gibbous, length and breadth nearly equal, the greatest width anterior to the middle. Dorsal valve often a little wider than long. Ventral valve slightly the more convex, the greatest depth being a little anterior to the umbones : beak extended and slightly incurved, and, in all the specimens examined, truncated by a broad rounded foramen, impressed near the front by a short shallow sinus which produces an arcuation of the dorsal valve in front. Surface marked by close concentric lines of growth, which are crowded into wrinkles on the sides of the shell. Interior substance of the shell fibrous, with an exterior covering which appears to be punctate.

This shell bears many features of *TEREBRATULA*. It differs from *M. barrisi* in the broader form, short and little defined sinus, and surface characters.

Geological formation and locality. Shales of the Hamilton group, in Western New-York.

MERISTA BARRISI (n.s.).

SHELL ovoid, more or less elongate or sometimes broadly ovate; proportions variable. Ventral valve extremely arcuate : beak incurved; mesial depression sometimes beginning about one-third the length below the beak, and becoming on the front of the shell a broad flattened sinus produced in a short linguiform extension. Dorsal valve little longer than wide, regularly convex, abruptly elevated near the anterior margin from the extension of the mesial sinus of the opposite valve. Surface smooth, or marked by regular concentric lines of growth; some at the margins crowded into wrinkles. The exfoliated shells show obscure radiating striae.

This species presents considerable variety of form; due, in the specimens examined, both to stages of growth and to accidents of compression, and also to the degree of development of the mesial sinus.

Geological formation and locality. In limestone of the Marcellus shale, near Leroy, N.York. From Rev. W. H. BARRIS.

MERISTA DORIS (n.s.).

SHELL subovate, elongate, compressed below the middle and the margins thin and sharp, gibbous on the umbones. Ventral valve with the beak elongate, attenuate and incurved; the sides below the beak abruptly compressed, making a concave area; regularly convex from the beak to below the middle of the valve, where it

is depressed into a shallow undefined sinus which is produced in front, and in old shells becomes a linguiform extension. Dorsal valve oval, narrowed towards the beak, a little more gibbous on the umbo than the opposite valve, depressed below the middle, and becoming in old shells abruptly bent upwards. Surface marked by close concentric lines of growth, and fine radiating striae are visible upon the surface in the exfoliated shell, and upon the cast. Shell-structure punctate.

I refer this and the preceding species, with some hesitation, to the Genus *MERISTA*. They correspond in general form, and this species has the mesial septum in the dorsal valve, and the two strong dental lamellæ in the ventral valve. I have seen no perfect beaks.

This species is readily distinguished by its greater proportional length and attenuation. Some half-grown shells show no evidence of a sinus, while in other individuals it becomes earlier distinct. One specimen measures an inch and three quarters in length, by an inch and a quarter in width : the usual length is from one and a quarter to one and a half inches, with a width of about one inch.

Geological formation and locality. In loose masses of limestone, south of YOUNG'S farm, Williamsville, Erie county.

MERISTELLA MULTICOSTA (n.s.).

SHELL ovate, subcircular or transverse, moderately gibbous : beak small, pointed, somewhat incurved. Ventral valve with a broad well-defined mesial sinus, reaching nearly to the beak; in elongated specimens, extended in front. Dorsal valve the most convex; mesial elevation most distinct in the upper part of the valve. Surface marked by strong angular plications, generally bifurcating; from six to ten on the mesial elevation, the lateral ones of which have their outer faces broad, forming the entire height of the elevation; the plications on each lateral portion of the shell about six or eight, variable in number. Numerous concentric wrinkles cross the striae, giving a broken aspect to the surface. Substance of the shell extremely thin.

This species differs from *M. quadricostata* of the upper black shales, in being much larger and more robust. The mesial lobe is always distinctly marked; the plications are strong, angular, and cover the whole shell.

Geological formation and locality. Shales of the Hamilton group, in numerous localities in Western New-York.

The following species, described under the Genera *ORTHIS* and *ATRYPA*, belong to the Genus *MERISTELLA*.

MERISTELLA LIMITARIS.

Orthis limitaris : VANUXEM, Rep. 3d Geol. Dist. New-York, 1843, p. 146, f. 3.

Atrypa limitaris : HALL, Rep. 4th Geol. Dist. New-York, p. 182, f. 11.

SHELL moderately gibbous, subcircular or transverse. Dorsal valve with a broad mesial elevation. Ventral valve with sinus only on the anterior portion. Surface covered by numerous fine plications, mostly simple.

When found in limestone, it is full and well formed; but in the thinly laminated shales it is usually compressed, and occurs in great numbers.

Geological formation and locality. In the black shales at the base of the Hamilton group, at Leroy and Avon, N.York.

MERISTELLA QUADRICOSTATA.

Orthis quadricostata : VANUXEM, Report on 3d Geol. Dist. New-York, 1843, p. 168.

Atrypa quadricostata : HALL, Report on 4th Geol. Dist. New-York, p. 223, f. 2.

SHELL thin, flattened, transverse, marked by distinct rounded plications in the middle of the valves; lateral portions plain, or with faintly marked plications; without distinct mesial fold or sinus.

This species is smaller than the preceding, with fewer radiating plications. It differs from *M. multicosta* in the absence of a mesial fold, and smaller number of ribs.

Geological formation and locality. Upper black shales of the Hamilton group: Bigstream point, Seneca county; and other places in Western New-York.

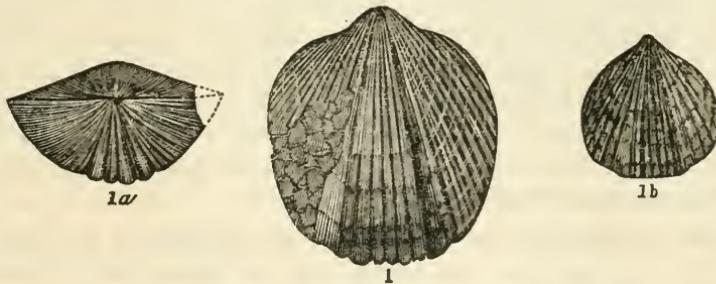
MERISTELLA MESACOSTALIS.

Atrypa mesacostalis : HALL, Report on 4th Geol. Dist. New-York. Illustrations of Fossils of the Chemung group, 64, ff. 1, 1 a, 1 b.

SHELL somewhat elongated, with moderately prominent beak. Valves convex, with well-defined mesial lobe and sinus, which are covered with plications; those bordering the sinus are the largest. Lateral portions of the shell smooth, or with obscure ribs.

This species is usually larger than any of the preceding, and is characterized by its elongate form and plain or obscurely marked lateral portions of the shell.

Geological formation and locality. In rocks of the Chemung group : Steuben county, and other parts of Western New-York.



MERISTELLA MESACOSTALIS.

FIG. 1, 1 a. Ventral and cardinal views of full-grown individuals of *M. mesacostalis*.

FIG. 1 b. Ventral view of a young individual of the same species.

NOTE ON THE GENUS CYPRICARDITES.

IN the Twelfth Annual Report of the Regents upon the State Cabinet, 1859, I communicated a notice of the Genera AMBONYCHIA, PALÆARCA and MEGAMBONIA; the descriptions of the two last genera having been sometime previously printed in Vol. iii, Pal. N.Y.

At that time, a comparison of specimens led me to refer to the original description and figure of CYPRICARDITES of CONRAD; and I appended his description, with an outline figure copied from a plate by that author. I suggested that the genus corresponded in many respects with PALÆARCA, and I recognized the priority of CYPRICARDITES. In reference to the figure, I wrote as follows :

" This figure is copied from the original figure of Mr. CONRAD, accompanying his description of the genus in 1841. The plate upon which this occurs was engraved to accompany the Annual Report of 1841 ; but unfortunately only a small number were ever distributed*, so far as known to the writer. The same plate contains illustrations of the Genera NUCULITES, LYRODESMA, ORTHONOTA, CYRTOLITES, ORTHOSTOMA, DICTYOCRINUS, ASPIDOLITES and DICRANURUS, as well as one species of PLATYCERAS, all genera proposed by Mr. CONRAD. At the time I proposed the Genus PALÆARCA in 1847, I had overlooked the description and figure of CYPRICARDITES ; and it is only since the printing of that part of Vol. iii, Palæontology of New-York, that my attention has been directed to the subject of the preceding note."

In the Canadian Journal of Industry and Science for July 1861, page 354, Mr. BILLINGS proposes to give a history† of the Genus CYRTODON, and makes the following remarks :

" In the Fifth Annual Report on the Palæontology of New-York, Conrad, in 1841, characterized his genus *Cypricardites*, and described sixteen species from the Silurian and Devonian rocks of the State. He did not give any illustrations, but it now appears that he prepared a figure (showing the character of the hinge) which however remained in Professor Hall's hands eighteen years without publication. In the 8th volume of the Journal of the Academy of Natural Sciences, Conrad described seven other species from the Devonian rocks of New-York. These are all figured.

* I inferred that only a small number of copies of the plate were published with the Report ; but it may have been more extensively distributed than I supposed, for I have found five copies among my own volumes.

† One of the histories of the genus.

"In 1847, Professor Hall suppressed the genus *Cypricardites*, and substituted his own genus *Modiolopsis*, in which he placed all Conrad's Lower Silurian species."

Had these remarks of Mr. BILLINGS concerned myself alone, I would not have noticed them; but as I am charged, in a respectable journal, with suppressing a genus proposed by Mr. CONRAD, and with holding in my hands "for eighteen years without publication" a figure showing the characters of the hinge, I cannot, in justice to Mr. CONRAD and myself, do otherwise than communicate a copy of the lithographic plate to which I originally referred, and which was published with his Report in 1841, and circulated with some but not with all the copies.

I proposed the Genus *Modiolopsis*, not as a substitute for *CYPRICARDITES*, but because the species included under that name did not appear to be congeneric; and I separated some of those which did not possess the typical marks of *CYPRICARDITES*.

With regard to the propriety of adopting the name *CYPRICARDITES*, on account of a zoological error involved, it is scarcely worth while to offer argument. We have too many analogous cases, and that of the Genus *Athyris* may serve as an illustration. Mr. CONRAD is doubtless entitled to the priority of discovery, description and illustration of the characters of the Genus *CYPRICARDITES*; and I cannot suppose that another generic term, applied to shells of precisely the same character, will supersede the original name.

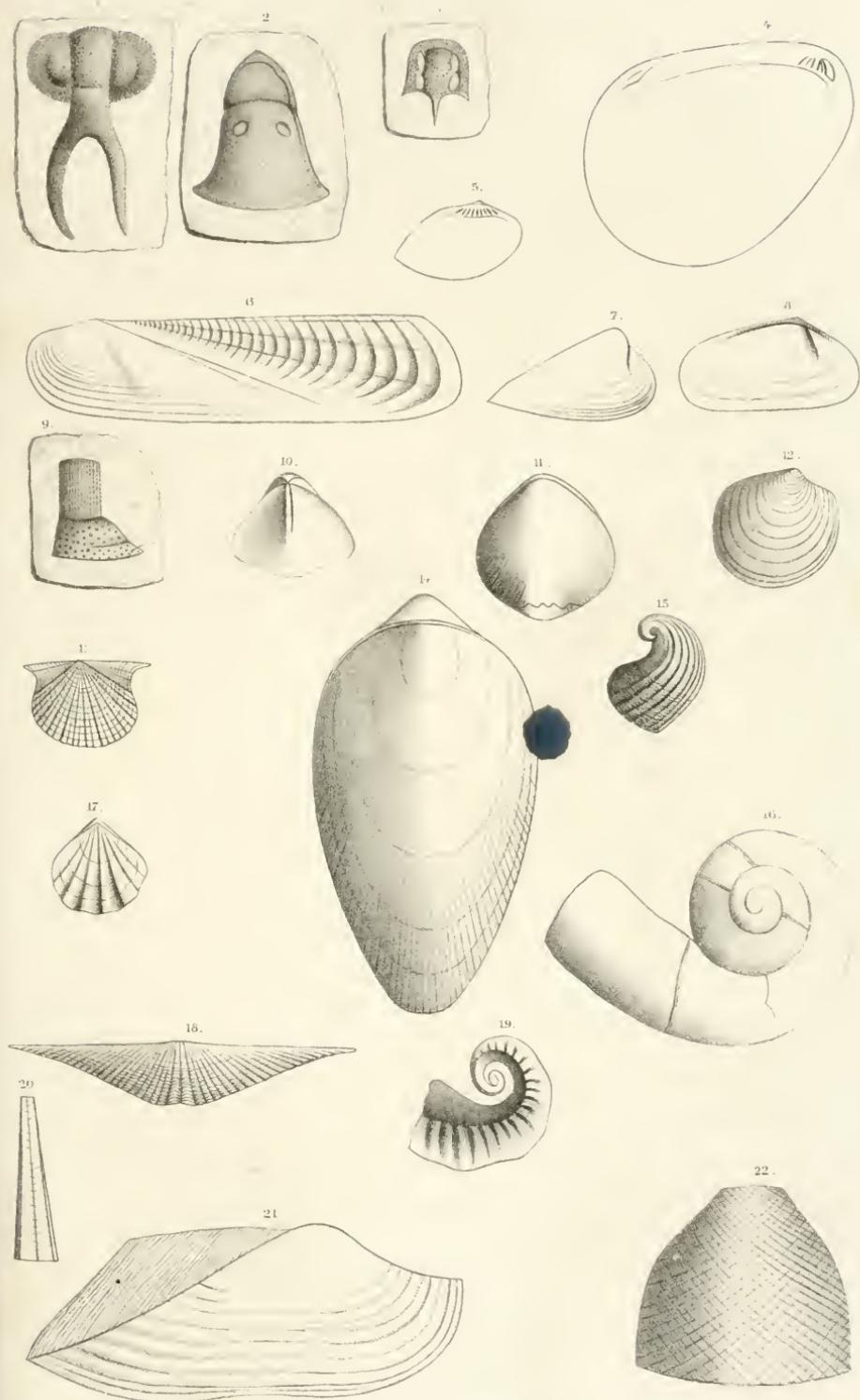
In reference to the Genera *MEGALOMUS* and *MEGAMBONIA**^{*}, I can have no controversy with Mr. BILLINGS. If naturalists are content to accept his assertions without other evidence, I shall not complain: the typical species will remain, and may, at some future time, be studied without passion or prejudice.

* A small amount of conchological knowledge is sufficient to show that these forms are not only generically distinct, but that they belong to a different *family* of shells from those described as *PALÆARCA* or *CYRTODONTA*.

EXPLANATION OF PLATE II.

- Fig. 1. *DICRANURUS* : Conrad, Annual Report for 1841, p. 48.
Fig. 2. *ASPIDOLITES* : Conrad, Annual Report 1841, p. 48.
Fig. 3. *ACIDASPIS TUBERCULATUS* : Conrad, Annual Report 1840, p. 205.
Fig. 4. *CYPRICARDITES* : Conrad, Annual Report 1841, p. 51.
Fig. 5. *LYRODESMA* : Conrad, Annual Report 1841, p. 51.
Fig. 6. *ORTHONOTA UNDULATA* : Conrad, Annual Report 1841, p. 50.
Fig. 7. *NUCULITES CUNEIFORMIS* : Conrad, Annual Report 1841, p. 50.
Fig. 8. *N. OBLONGATUS* : Conrad, Annual Report 1841, p. 50.
Fig. 9. *ASAPHUS ADSPECTANS* : Conrad, Annual Report 1841, p. 49.
Fig. 10. *ATRYPA UNISULCATA* : Conrad, Annual Report 1841, p. 56.
Fig. 11. *ATRYPA PECULIARIS* : Conrad, Annual Report 1841, p. 56.
Fig. 12. *POSIDONIA LIRATA* : Conrad, Annual Report 1838, p. 116.
Fig. 13. *AVICULA BELLA* : Conrad, Annual Report 1841, p. 54.
Fig. 14. *ATRYPA ELONGATA* : Conrad, Annual Report 1839, p. 65.
Fig. 15. *PLATYCERAS SULCATUS* : Conrad, Annual Report 1841, p. 56.
Fig. 16. *ORTHOSTOMA COMMUNIS* : Conrad, Annual Report 1838, p. 119.
Fig. 17. *ATRYPA ACUTIPPLICATA* : Conrad, Annual Report 1841, p. 54.
Fig. 18. *DELTHYRIS MUCRONATA* : Conrad, Annual Report 1841, p. 54.
Fig. 19. *CYRTOLITES* : Conrad, Annual Report 1838, p. 118.
Fig. 20. *CONULARIA LAQUEATA* : Conrad, Annual Report 1841, p. 57.
Fig. 21. *CYPRICARDITES CARINATA* : Conrad, Annual Report 1841, p. 53.
Fig. 22. *DICTUOCRINITES* : Conrad.

PLATE 11



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Swinton, lith.



NOTES AND CORRECTIONS.

GENUS PHOLIDOPS.

In the Addenda to Vol. iii, Palæontology of New-York, p. 489, I have noticed and described a new genus under the name PHOLIDOPS; expressing some doubt whether it may be a patelliform univalve, or a bivalve shell, since the only specimen where two valves were shown in connexion was not entirely satisfactory.

In the Thirteenth Report upon the State Cabinet, p. 92, I noticed the genus, and described an additional species, expressing my belief that the shell was univalve. The numerous specimens observed in the Hamilton group are all of single valves; and hence I was led to the conclusion, that in the Oriskany sandstone species, showing two similar valves in contact, the relation was only accidental.

During the last year, however, I have found among some collections from the Niagara group in Indiana, another species with two similar valves closely conjoined; thus leaving no longer a doubt regarding the bivalve nature of these fossils. The specimen here referred to, and the *Pholidops terminalis* of the Oriskany sandstone, have both valves entire, and there is no perforation as in *DISCINA*. There may have been a foramen or opening between the valves at the apex, for the protrusion of a pedicel. The description therefore requires to be modified.

GENUS PHOLIDOPS (*as emended*).

SHELL small, bivalve : valves patelliform; apex anterior, subcentral, excentric or terminal. Surface marked by concentric lamellæ of growth, which are more expanded on the posterior side. Interior of the valves a shallow oval cavity, with a bilobed or horseshoe-shaped muscular impression in one of the valves; the margins flattened or sometimes slightly deflected, and entire.

Shells known in the Niagara and Lower Helderberg groups, Oriskany sandstone and Hamilton group.

GONIATITES PATERSONI (HALL).

Thirteenth Report of the Regents on the State Cabinet, p. 99.

The fragment figured was given to me many years since by a person residing in the neighborhood of the locality, which is in the Hamilton shales; and I could have no reason to doubt the correctness of the position assigned to it.

Recently, however, Prof. WINCHELL has called my attention to a figure of a Goniatite which is evidently specifically identical with *G. patersoni*, the original of which was found in the rocks of the Portage group*. About the same time, Prof. DEWEY, of Rochester, showed me some specimens of the same species, from the south part of Livingston county, which, from the character of the adhering green shale, left no doubt as to the geological formation from which they were derived. It will probably be found that the *G. patersoni* is not a Hamilton fossil, and that the specimen originally described was thus associated through erroneous information.

Fourteenth Report on State Cabinet, p. 91, for *Cyclonema ventricosa*, read *Cyclonema varicosa*. Pages 96, 97 & 98, change the name *Clioderma* to *Pterotheca*.

Thirteenth Report on State Cabinet, p. 113 : NOTE UPON THE TRILOBITES
OF THE HUDSON-RIVER GROUP IN THE TOWN OF GEORGIA, VERMONT.

THIS title was changed in a part of the edition, by substituting the words "Quebec group" for "Hudson-river group", in deference to the views advanced by the Geological Survey of Canada. A note, giving an explanation of the reasons for this change, should have been inserted at the end of the Report.

We now know that the rocks included in the Quebec group are of the same age as those of the Hudson-river group in its typical localities in the Hudson valley, but not identical with the Pulaski and Lorraine shales heretofore united with the Hudson-river group.

* "At Portage falls, Livingston county, New-York, in shaly sandstone of the Lower Portage."

Twelfth Annual Report of the Regents on the State Cabinet.

THE first seventeen pages of the palæontological part of this Report were printed and stereotyped in January and the early part of February, 1859; and nearly one hundred copies were distributed immediately thereafter. The entire report was printed and published previous to the 20th September, 1859; and any person, procuring proofsheets from the printer "*in the beginning of the month of August*", must have obtained the sheets at least as far as page 56, which had been printed in the early part of July. The proofsheets of the Tenth Report were in like manner *procured from the printer*, as fast as issued. Similar practices have been resorted to by interested parties, with respect to other reports; proofsheets having been obtained from the printing-office, many months in advance of publication : and I wish simply to record the fact in this place. I had supposed that authors considered such proceedings disreputable, and I scarcely believe that there can be a difference of opinion among gentlemen in regard to acts of this kind. [See Canadian Journal of Industry and Science, N. S. No. 34, p. 355; and Canadian Naturalist and Geologist, Vol. vi, No. 4, p. 317.]

Fifteenth Report on the State Cabinet.

THE woodcuts, arranged in pages in this Report, were originally intended to be inserted in their appropriate places with the descriptions of the species; but a considerable part of the report having been stereotyped and printed last year, it became impossible to accomplish this object.

The palæontological part of the Report, as far as page 112, was published in advance in the months of August and September, 1861. The descriptions of the Crinoidea were published in July 1862, and the entire Report will be published in the first days of October 1862.

JAMES HALL.

THE following is appended to this Report, as the last sheets
are passing through the press.

A few weeks since, an interesting collection of teeth and plates
of fishes, supposed to be from the Old Red Sandstone of Delaware
county, was received at the Geological Rooms. The Curator was
directed to visit the locality, for the purpose of enlarging the col-
lection. The following is his report.

ALBANY, SEPTEMBER 20, 1862.

DR. S. B. WOOLWORTH, *Secretary of Regents, &c.*

SIR :

AGREEABLE to your directions, I went to Delaware county, to collect
fossils from the Catskill group, or Old Red Sandstone.

At Franklin I found Mr. J. M. WAY, a gentleman who for years has
been examining the rock and collecting the fossils; and although he is
unacquainted with any other localities, and has never seen a collection
of fossils, he has succeeded in investigating the whole strata of the
neighborhood and collecting many fossils. With his assistance, I was
able to make a section from the Oleout creek to the top of a hill about
three miles southwest of the village of Franklin, more than 800 feet in
thickness. The base is a brick red shale, with occasional red argillaceous
sandstone, about 400 feet. On this is about fifty feet of greenish shale;
on which lies a stratum of gray sandstone, with teeth and plates of fishes,
and fossils of the *Chemung group*. Seventy feet of green shale lies on
this fossiliferous stratum; when another thin band of fossils, with gravel
and the same formation, continues with alternate shale and gray sand-
stone and fossils to the top of the hill, where the Chemung fossils are
more numerous. Spirifers, Rhynchonellas, Pectens and Athyres are found
in all the strata of the upper three hundred feet, and the whole formation
is undoubtedly Chemung.

I examined other localities with the same result.

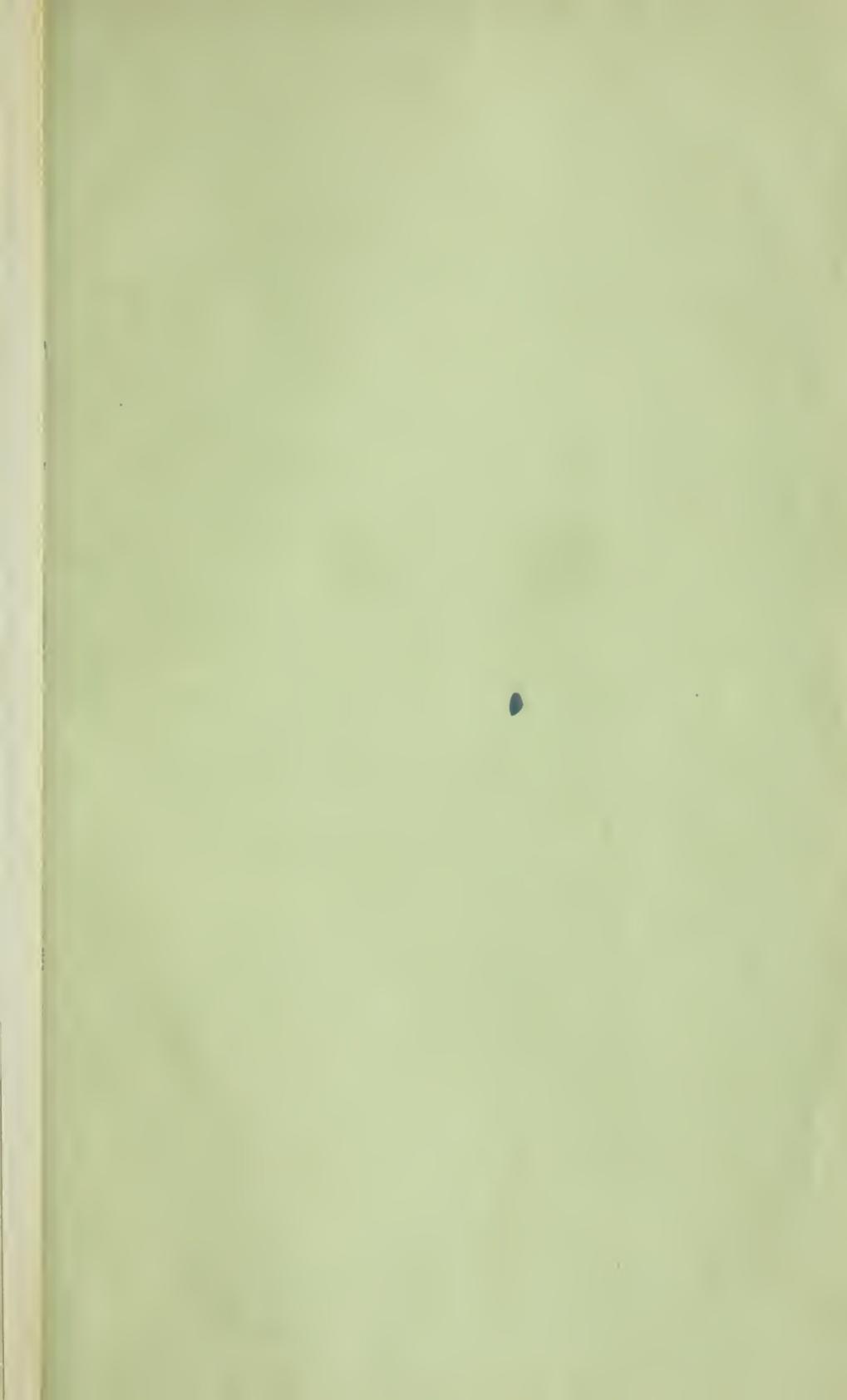
Mr. WAY has examined the rock as far as Deposite (twenty-five miles
southwest), with great care, and finds the same formation. He has also
collected the same fossils at Delhi, seventeen miles southwest.

From my investigation, I believe there is no Old Red Sandstone in this
State. I found no forms among the fish remains like those of the Old Red
Sandstone of Great Britain, but we have plates far larger than those
found there.

The Teeth closely resemble those described by Dr. NEWBERRY, from the
Corniferous rocks of Ohio and New-York.

Respectfully your obedient servant,

E. JEWETT.





P New York State Museum
Science Annual report
N 15(1861)

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